1984

Cessna

Information Manual

Skylane

Model 182R

PERFORMANCE - SPECIFICATIONS

*SPEED:		
Maximum at Sea Level		146 KNOTS
Cruise, 75% Power at 8000 Ft		142 KNOTS
CRUISE: Recommended lean mixture with fuel allowance for engine start, taxi, takeoff, climb and 45 minutes reserve.		
75% Power at 8000 Ft	Range	820 NM
88 Gallons Usable Fuel	Time	5.9 HRS
Maximum Range at 10,000 Ft	Range	1025 NM
88 Gallons Usable Fuel	Time	9.6 HRS
RATE OF CLIMB AT SEA LEVEL		865 FPM
SERVICE CEILING		14,900 FT
TAKEOFF PERFORMANCE:		
Ground Roll		805 FT
Total Distance Over 50-Ft Obstacle		1515 FT
LANDING PERFORMANCE:		
Ground Roll		590 FT
Total Distance Over 50-Ft Obstacle		1350 FT
STALL SPEED (KCAS):		
Flaps Up, Power Off		54 KNOTS
Flaps Down, Power Off		49 KNOTS
MAXIMUM WEIGHT:		
Ramp		3110 LBS
Takeoff		3100 LBS
Landing		2950 LBS
STANDARD EMPTY WEIGHT:		
Skylane		1734 LBS
Skylane II		1780 LBS
MAXIMUM USEFUL LOAD:		
Skylane		1376 LBS
Skylane II		1330 LBS
BAGGAGE ALLOWANCE		200 LBS
WING LOADING: Pounds Sq Ft		17.8
POWER LOADING: Pounds HP		13.5
FUEL CAPACITY: Total		92 GAL.
OIL CAPACITY		13 QTS
ENGINE: Teledyne Continental 230 BHP at 2400 RPM		O-470-U
PROPELLER: Constant Speed, Diameter		82 IN.

*Speed performance is shown for an airplane equipped with optional speed fairings which increase the speeds by approximately 3 knots. There is a corresponding difference in range, while all other performance figures are unchanged when speed fairings are installed.

The above performance figures are based on the indicated weights, standard atmospheric conditions, level hard-surface dry runways and no wind. They are calculated values derived from flight tests conducted by the Cessna Aircraft Company under carefully documented conditions and will vary with individual airplanes and numerous factors affecting flight performance.

INTRODUCTION

This handbook contains 9 sections, and includes the material required to be furnished to the pilot by CAR Part 3. It also contains supplemental data supplied by Cessna Aircraft Company.

Section 1 provides basic data and information of general interest. It also contains definitions or explanations of symbols, abbreviations, and terminology commonly used.

DESCRIPTIVE DATA

ENGINE

Number of Engines: 1.
Engine Manufacturer: Teledyne Continental.
Engine Model Number: O-470-U.
Engine Type: Normally-aspirated, direct-drive, air-cooled, horizontally-opposed, carburetor-equipped, six-cylinder engine with 470 cu. in. displacement.
Horsepower Rating and Engine Speed: 230 rated BHP at 2400 RPM.

PROPELLER

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: C2A34C204/90DCB-8.
Number of Blades: 2.
Propeller Diameter, Maximum: 82 inches.
Minimum: 80.5 inches.
Propeller Type: Constant speed and hydraulically actuated, with a low pitch setting of 15.0° and a high pitch setting of 29.4° (30 inch station).

FUEL

Approved Fuel Grades (and Colors):
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).

NOTE

Isopropyl alcohol or ethylene glycol monomethyl ether may be added to the fuel supply. Additive concentrations shall not exceed 1% for isopropyl alcohol or .15% for ethylene glycol monomethyl ether. Refer to Section 8 for additional information.

Total Capacity: 92 gallons.
Total Capacity Each Tank: 46 gallons.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in figure 2-1.

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	175	179	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	140	143	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 3100 Pounds 2600 Pounds 2000 Pounds	 110 101 88	 111 102 88	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed: 0^o - 10^o Flaps 10^o - 20^o Flaps 20^o - FULL Flaps	 137 120 95	 140 120 95	Do not exceed these speeds with the given flap settings.
	Maximum Window Open Speed	175	179	Do not exceed this speed with windows open.

Figure 2-1. Airspeed Limitations

AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their color code significance are shown in figure 2-2.

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	40 - 95	Full Flap Operating Range. Lower limit is maximum weight V_{S_0} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	50 - 143	Normal Operating Range. Lower limit is maximum weight V_S at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	143 - 179	Operations must be conducted with caution and only in smooth air.
Red Line	179	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine Manufacturer: Teledyne Continental.
Engine Model Number: O-470-U.
Maximum Power: 230 BHP rating.
Engine Operating Limits for Takeoff and Continuous Operations:
Maximum Engine Speed: 2400 RPM.
Maximum Cylinder Head Temperature: 460°F (238°C).
Maximum Oil Temperature: 240°F (116°C).
Oil Pressure, Minimum: 10 psi.
Maximum: 100 psi.
Fuel Grade: See Fuel Limitations.
Oil Grade (Specification)
MIL-L-6082 Aviation Grade Straight Mineral Oil or Ashless Dispersant Oil conforming to Continental Motors Specification MHS-24 and all revisions thereto.
Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: C2A34C204/90DCB-8
Propeller Diameter, Maximum: 82 inches.
Minimum: 80.5 inches.
Propeller Blade Angle at 30 Inch Station, Low: 15.0°.
High: 29.4°.

FUEL LIMITATIONS

2 Standard Tanks: 46 U.S. gallons each.
Total Fuel: 92 U.S. gallons.
Usable Fuel (all flight conditions): 88 U.S. gallons.
Unusable Fuel: 4 U.S. gallons.

NOTE

To ensure maximum fuel capacity when refueling and minimize cross-feeding when parked on a sloping surface, place the fuel selector valve in either LEFT or RIGHT position.

Take off and land with the fuel selector valve handle in the BOTH position.

Operation on either left or right tank limited to level flight only.

With 1/4 tank or less, prolonged uncoordinated flight is prohibited when operating on either left or right tank.

Approved Fuel Grades (and Colors):
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).

OTHER LIMITATIONS

FLAP LIMITATIONS

Approved Takeoff Range: 0° to 20°.
Approved Landing Range: 0° to FULL.

3. On the fuel selector valve plate:

BOTH
88.0 GAL.
TAKEOFF LANDING
ALL FLIGHT ATTITUDES

FUEL
SELECTOR

LEFT
44.0 GAL.
LEVEL FLIGHT ONLY

RIGHT
44.0 GAL.
LEVEL FLIGHT ONLY

OFF OFF

4. On the baggage door:

120 POUNDS MAXIMUM
BAGGAGE AND/OR AUXILIARY PASSENGER
FORWARD OF BAGGAGE DOOR LATCH AND
80 POUNDS MAXIMUM
BAGGAGE AFT OF BAGGAGE DOOR LATCH
MAXIMUM 200 POUNDS COMBINED
FOR ADDITIONAL LOADING INSTRUCTIONS
SEE WEIGHT AND BALANCE DATA

5. On flap control indicator:

0° to 10°	140 KIAS	(partial flap range with dark blue color code; also, mechanical detent at 10°.)
10° to 20°	120 KIAS	(light blue color code; also, mechanical detent at 20°.)
20° to FULL	95 KIAS	(white color code.)

6. Forward of fuel tank filler cap:

FUEL

100LL/100 MIN. GRADE AVIATION GASOLINE
CAP. 46.0 U.S. GAL.
CAP. 34.5 U.S. GAL. TO BOTTOM OF FILLER NECK

7. A calibration card must be provided to indicate the accuracy of the magnetic compass in 30° increments.

8. On oil filler cap:

OIL
12 QTS

9. Near airspeed indicator:

MANEUVER SPEED
111 KIAS

10. Forward of each fuel tank filler cap in line with fwd arrow (used when flush-type filler caps are installed):

FUEL CAP FWD ▲ ARROW ALIGNMENT
CAP MUST NOT ROTATE DURING CLOSING

11. On fuselage sidewall adjacent to the battery:

CAUTION 24 VOLTS D.C.
This aircraft is equipped with alternator and a negative ground system.
OBSERVE PROPER POLARITY
Reverse polarity will damage electrical components.

INTRODUCTION

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur. Emergencies caused by airplane or engine malfunctions are extremely rare if proper preflight inspections and maintenance are practiced. Enroute weather emergencies can be minimized or eliminated by careful flight planning and good judgment when unexpected weather is encountered. However, should an emergency arise, the basic guidelines described in this section should be considered and applied as necessary to correct the problem. Emergency procedures associated with ELT and other optional systems can be found in Section 9.

AIRSPEEDS FOR EMERGENCY OPERATION

Engine Failure After Takeoff:	
Wing Flaps Up	75 KIAS
Wing Flaps Down	70 KIAS
Maneuvering Speed:	
3100 Lbs	111 KIAS
2600 Lbs	102 KIAS
2000 Lbs	88 KIAS
Maximum Glide:	
3100 Lbs	76 KIAS
2600 Lbs	70 KIAS
2000 Lbs	61 KIAS
Precautionary Landing With Engine Power	70 KIAS
Landing Without Engine Power:	
Wing Flaps Up	75 KIAS
Wing Flaps Down	70 KIAS

OPERATIONAL CHECKLISTS

Procedures in the Operational Checklists portion of this section shown in **bold-faced** type are immediate-action items which should be committed to memory.

ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF ROLL

1. **Throttle -- IDLE.**

2. **Brakes -- APPLY.**
3. Wing Flaps -- RETRACT.
4. Mixture -- IDLE CUT-OFF.
5. Ignition Switch -- OFF.
6. Master Switch -- OFF.

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

1. **Airspeed -- 75 KIAS (flaps UP).**
   70 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED (FULL recommended).
6. Master Switch -- OFF.

ENGINE FAILURE DURING FLIGHT (RESTART PROCEDURES)

1. **Airspeed -- 75 KIAS.**
2. **Carburetor Heat -- ON.**
3. **Fuel Selector Valve -- BOTH**
4. Mixture -- RICH.
5. Ignition Switch -- BOTH (or START if propeller is stopped).
6. Primer -- IN and LOCKED.

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Airspeed -- 75 KIAS (flaps UP).
   70 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED (FULL recommended).
6. Master Switch -- OFF.
7. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
8. Touchdown -- SLIGHTLY TAIL LOW.
9. Brakes -- APPLY HEAVILY.

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Airspeed -- 75 KIAS.
2. Wing Flaps -- 20°.
3. Selected Field -- FLY OVER, noting terrain and obstructions, then

retract flaps upon reaching a safe altitude and airspeed.
4. Electrical Switches -- OFF.
5. Wing Flaps -- FULL (on final approach).
6. Airspeed -- 70 KIAS.
7. Avionics Power and Master Switches -- OFF.
8. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
9. Touchdown -- SLIGHTLY TAIL LOW.
10. Ignition Switch -- OFF.
11. Brakes -- APPLY HEAVILY.

DITCHING

1. Radio -- TRANSMIT MAYDAY on 121.5 MHz, giving location and intentions and SQUAWK 7700 if transponder is installed.
2. Heavy Objects (in baggage area) -- SECURE OR JETTISON.
3. Flaps -- 20° to FULL.
4. Power -- ESTABLISH 300 FT/MIN DESCENT at 65 KIAS.
5. Approach -- High Winds, Heavy Seas -- INTO THE WIND.
   Light Winds, Heavy Swells -- PARALLEL TO SWELLS.

NOTE

If no power is available, approach at 75 KIAS with flaps up or at 70 KIAS with 10° flaps.

6. Cabin Doors -- UNLATCH.
7. Touchdown -- LEVEL ATTITUDE AT ESTABLISHED DESCENT.
8. Face -- CUSHION at touchdown with folded coat.
9. Airplane -- EVACUATE through cabin doors. If necessary, open window and flood cabin to equalize pressure so doors can be opened.
10. Life Vests and Raft -- INFLATE.

FIRES

DURING START ON GROUND

1. **Cranking -- CONTINUE,** to get a start which would suck the flames and accumulated fuel through the carburetor and into the engine.

If engine starts:

2. Power -- 1700 RPM for a few minutes.
3. Engine -- SHUTDOWN and inspect for damage.

If engine fails to start:

4. **Throttle -- FULL OPEN.**
5. **Mixture -- IDLE CUT-OFF.**
6. **Cranking -- CONTINUE.**
7. Fire Extinguisher -- OBTAIN (have ground attendants obtain if not installed).
8. Engine -- SECURE.
   a. Master Switch -- OFF.
   b. Ignition Switch -- OFF.
   c. Fuel Selector Valve -- OFF.
9. Fire -- EXTINGUISH using fire extinguisher, wool blanket, or dirt.
10. Fire Damage -- INSPECT, repair damage or replace damaged components or wiring before conducting another flight.

ENGINE FIRE IN FLIGHT

1. **Mixture -- IDLE CUT-OFF.**
2. **Fuel Selector Valve -- OFF.**
3. Master Switch -- OFF.
4. Cabin Heat and Air -- OFF (except overhead vents).
5. Airspeed -- 100 KIAS (If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture).
6. Forced Landing -- EXECUTE (as described in Emergency Landing Without Engine Power).

ELECTRICAL FIRE IN FLIGHT

1. **Master Switch -- OFF.**
2. **Vents/Cabin Air/Heat -- CLOSED.**
3. **Fire Extinguisher -- ACTIVATE** (if available).

WARNING

After discharging an extinguisher within a closed cabin, ventilate the cabin.

4. Avionics Power Switch -- OFF.
5. All Other Switches (except ignition switch) -- OFF.

If fire appears out and electrical power is necessary for continuance of flight:

6. Master Switch -- ON.
7. Circuit Breakers -- CHECK for faulty circuit, do not reset.

8. Radio Switches -- OFF.
9. Avionics Power Switch -- ON.
10. Radio/Electrical Switches -- ON one at a time, with delay after each until short circuit is localized.
11. Vents/Cabin Air/Heat -- OPEN when it is ascertained that fire is completely extinguished.

CABIN FIRE

1. **Master Switch -- OFF.**
2. **Vents/Cabin Air/Heat -- CLOSED** (to avoid drafts).
3. **Fire Extinguisher -- ACTIVATE** (if available).

WARNING

After discharging an extinguisher within a closed cabin, ventilate the cabin.

4. **Land the airplane as soon as possible to inspect for damage.**

WING FIRE

1. **Pitot Heat Switch (if installed) -- OFF.**
2. **Navigation Light Switch -- OFF.**
3. **Strobe Light Switch (if installed) -- OFF.**

NOTE

Perform a sideslip to keep the flames away from the fuel tank and cabin, and land as soon as possible using flaps only as required for final approach and touchdown.

ICING

INADVERTENT ICING ENCOUNTER

1. **Turn pitot heat switch ON** (if installed).
2. **Turn back or change altitude** to obtain an outside air temperature that is less conducive to icing.
3. **Pull cabin heat control full out and rotate defroster control clockwise** to obtain maximum defroster airflow.
4. Increase engine speed to minimize ice build-up on propeller blades.
5. Watch for signs of carburetor air filter ice and apply carburetor

heat as required. An unexplained loss in manifold pressure could be caused by carburetor ice or air intake filter ice. Lean the mixture if carburetor heat is used continuously.

6. Plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable "off airport" landing site.
7. With an ice accumulation of 1/4 inch or more on the wing leading edges, be prepared for significantly higher stall speed.
8. Leave wing flaps retracted. With a severe ice build-up on the horizontal tail, the change in wing wake airflow direction caused by wing flap extension could result in a loss of elevator effectiveness.
9. Open left window and if practical scrape ice from a portion of the windshield for visibility in the landing approach.
10. Perform a landing approach using a forward slip, if necessary, for improved visibility.
11. Approach at 80 to 90 KIAS depending upon the amount of ice accumulation.
12. Perform a landing in level attitude.

STATIC SOURCE BLOCKAGE
(Erroneous Instrument Reading Suspected)

1. **Static Pressure Alternate Source Valve (if installed) -- PULL ON.**

NOTE

In an emergency on airplanes not equipped with an alternate static source, cabin pressure can be supplied to the static pressure instruments by breaking the glass in the face of the vertical speed indicator.

2. Airspeed -- Consult appropriate table in Section 5.
3. Altitude -- Cruise 50 feet higher and approach 30 feet higher than normal.

LANDING WITH A FLAT MAIN TIRE

1. Approach -- NORMAL.
2. Wing Flaps -- FULL DOWN.
3. Touchdown -- GOOD TIRE FIRST, hold airplane off flat tire as long as possible with aileron control.
4. Directional Control -- MAINTAIN using brake on good wheel as required.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

AMMETER SHOWS EXCESSIVE RATE OF CHARGE
(Full Scale Deflection)

1. Alternator -- OFF.

CAUTION

With the alternator side of the master switch off, compass deviations of as much as 25° may occur.

2. Alternator Circuit Breaker -- PULL.
3. Nonessential Electrical Equipment -- OFF.
4. Flight -- TERMINATE as soon as practical.

LOW-VOLTAGE LIGHT ILLUMINATES DURING FLIGHT
(Ammeter Indicates Discharge)

NOTE

Illumination of the low-voltage light may occur during low RPM conditions with an electrical load on the system such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system.

1. Avionics Power Switch -- OFF.
2. Alternator Circuit Breaker -- CHECK IN.
3. Master Switch -- OFF (both sides).
4. Master Switch -- ON.
5. Low-Voltage Light -- CHECK OFF.
6. Avionics Power Switch -- ON.

If low-voltage light illuminates again:

7. Alternator -- OFF.

CAUTION

With the alternator side of the master switch off, compass deviations of as much as 25° may occur.

8. Nonessential Radio and Electrical Equipment -- OFF.
9. Flight -- TERMINATE as soon as practical.

AMPLIFIED PROCEDURES

The following Amplified Procedures elaborate upon information contained in the Operational Checklists portion of this section. These procedures also include information not readily adaptable to a checklist format, and material to which a pilot could not be expected to refer in resolution of a specific emergency.

ENGINE FAILURE

If an engine failure occurs during the takeoff run, the most important thing to do is stop the airplane on the remaining runway. Those extra items on the checklist will provide added safety after a failure of this type.

Prompt lowering of the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after takeoff. In most cases, the landing should be planned straight ahead with only small changes in direction to avoid obstructions. Altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway. The checklist procedures assume that adequate time exists to secure the fuel and ignition systems prior to touchdown.

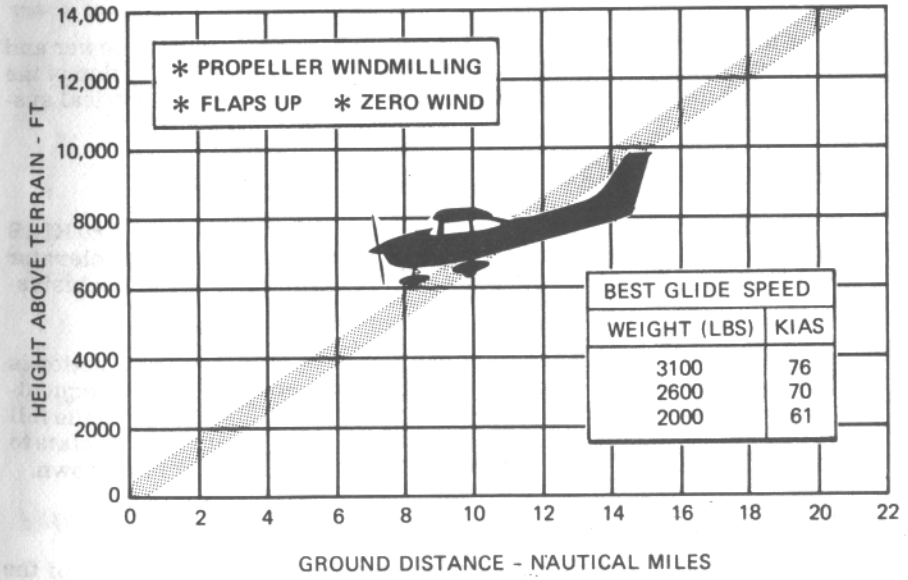

Figure 3-1. Maximum Glide

After an engine failure in flight, the best glide speed as shown in figure 3-1 should be established as quickly as possible. While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, an engine restart should be attempted as shown in the checklist. If the engine cannot be restarted, a forced landing without power must be completed.

FORCED LANDINGS

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as discussed in the checklist for Emergency Landing Without Engine Power.

Before attempting an "off airport" landing with engine power available, one should fly over the landing area at a safe but low altitude to inspect the terrain for obstructions and surface conditions, proceeding as discussed under the Precautionary Landing With Engine Power checklist.

Prepare for ditching by securing or jettisoning heavy objects located in the baggage area and collect folded coats for protection of occupants' face at touchdown. Transmit Mayday message on 121.5 MHz giving location and intentions and squawk 7700 if a transponder is installed. Avoid a landing flare because of difficulty in judging height over a water surface.

In a forced landing situation, do not turn off the avionics power and master switches until a landing is assured. Premature deactivation of the switches will disable the encoding altimeter and airplane electrical systems.

LANDING WITHOUT ELEVATOR CONTROL

Trim for horizontal flight with an airspeed of approximately 80 KIAS by using throttle and elevator trim control. Then **do not change the elevator trim control setting**; control the glide angle by adjusting power exclusively.

At flareout, the nose-down moment resulting from power reduction is an adverse factor and the airplane may hit on the nose wheel. Consequently, at flareout, the elevator trim control should be adjusted toward the full nose-up position and the power adjusted so that the airplane will rotate to the horizontal attitude for touchdown. Close the throttle at touchdown.

FIRES

Although engine fires are extremely rare in flight, the steps of the appropriate checklist should be followed if one is encountered. After

completion of this procedure, execute a forced landing. Do not attempt to restart the engine.

The initial indication of an electrical fire is usually the odor of burning insulation. The checklist for this problem should result in elimination of the fire.

EMERGENCY OPERATION IN CLOUDS (Vacuum System Failure)

In the event of a complete vacuum system failure during flight, the directional indicator and attitude indicator will be disabled, and the pilot will have to rely on the turn coordinator if he inadvertently flies into clouds. If an autopilot is installed, it too can be affected and should be turned off. Refer to Section 9, Supplements, for additional details concerning autopilot operation. The following instructions assume that only the electrically-powered turn coordinator is operative, and that the pilot is not completely proficient in instrument flying.

EXECUTING A 180° TURN IN CLOUDS

Upon inadvertently entering the clouds, an immediate plan should be made to turn back as follows:

1. Note the compass heading.
2. Note the time of the minute hand and observe the position of the sweep second hand on the clock.
3. When the sweep second hand indicates the nearest half-minute, initiate a standard rate left turn, holding the turn coordinator symbolic airplane wing opposite the lower left index mark for 60 seconds. Then roll back to level flight by leveling the miniature airplane.
4. Check accuracy of the turn by observing the compass heading which should be the reciprocal of the original heading.
5. If necessary, adjust heading primarily with skidding motions rather than rolling motions so that the compass will read more accurately.
6. Maintain altitude and airspeed by cautious application of elevator control. Avoid overcontrolling by keeping the hands off the control wheel as much as possible and steering only with rudder.

EMERGENCY DESCENT THROUGH CLOUDS

If conditions preclude reestablishment of VFR flight by a 180° turn, a descent through a cloud deck to VFR conditions may be appropriate. If possible, obtain radio clearance for an emergency descent through clouds.

To guard against a spiral dive, choose an easterly or westerly heading to minimize compass card swings due to changing bank angles. In addition, keep hands off the control wheel and steer a straight course with rudder control by monitoring the turn coordinator. Occasionally check the compass heading and make minor corrections to hold an approximate course. Before descending into the clouds, set up a stabilized let-down condition as follows:

1. Apply full rich mixture.
2. Apply full carburetor heat.
3. Reduce power to set up a 500 to 800 ft/min rate of descent.
4. Adjust the elevator and rudder trim control wheels for a stabilized descent at 80 KIAS.
5. Keep hands off control wheel.
6. Monitor turn coordinator and make corrections by rudder alone.
7. Adjust rudder trim to relieve unbalanced rudder force, if present.
8. Check trend of compass card movement and make cautious corrections with rudder to stop turn.
9. Upon breaking out of clouds, resume normal cruising flight.

RECOVERY FROM A SPIRAL DIVE

If a spiral is encountered, proceed as follows:

1. Close the throttle.
2. Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
3. Cautiously apply elevator back pressure to slowly reduce the indicated airspeed to 80 KIAS.
4. Adjust the elevator trim control to maintain an 80 KIAS glide.
5. Keep hands off the control wheel, using rudder control to hold a straight heading. Use rudder trim to relieve unbalanced rudder force, if present.
6. Apply carburetor heat.
7. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
8. Upon breaking out of clouds, resume normal cruising flight.

INADVERTENT FLIGHT INTO ICING CONDITIONS

Flight into icing conditions is prohibited. An inadvertent encounter with these conditions can best be handled using the checklist procedures. The best procedure, of course, is to turn back or change altitude to escape icing conditions.

STATIC SOURCE BLOCKED

If erroneous readings of the static source instruments (airspeed, altimeter and vertical speed) are suspected due to water, ice or other foreign matter in the pressure lines going to the standard external static pressure sources, the static pressure alternate source valve should be pulled on. A chart in Section 5 provides a correction which may be applied to the indicated airspeeds listed in this handbook resulting from inaccuracies in the alternate static source pressures. To avoid the possibility of large errors, the windows should not be open when using the alternate static source.

NOTE

In an emergency on airplanes not equipped with an alternate static source, cabin pressure can be supplied to the static pressure instruments by breaking the glass in the face of the vertical speed indicator.

SPINS

Intentional spins are prohibited in this airplane. Should an inadvertent spin occur, the following recovery procedure should be used:

1. RETARD THROTTLE TO IDLE POSITION.
2. PLACE AILERONS IN NEUTRAL POSITION.
3. APPLY AND **HOLD** FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION.
4. JUST **AFTER** THE RUDDER REACHES THE STOP, MOVE THE WHEEL **BRISKLY** FORWARD FAR ENOUGH TO BREAK THE STALL.
5. **HOLD** THESE CONTROL INPUTS UNTIL ROTATION STOPS Premature relaxation of the control inputs may extend the recovery.
6. AS ROTATION STOPS, NEUTRALIZE RUDDER, AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE.

NOTE

If disorientation precludes a visual determination of the direction of rotation, the symbolic airplane in the turn coordinator may be referred to for this information.

ROUGH ENGINE OPERATION OR LOSS OF POWER

CARBURETOR ICING

An unexplained drop in manifold pressure and eventual engine roughness may result from the formation of carburetor ice. To clear the ice, apply full throttle and pull the carburetor heat knob full out until the engine runs smoothly; then remove carburetor heat and readjust the throttle. If conditions require the continued use of carburetor heat in cruise flight, use the minimum amount of heat necessary to prevent ice from forming and lean the mixture for smoothest engine operation.

SPARK PLUG FOULING

A slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits. This may be verified by turning the ignition switch momentarily from BOTH to either L or R position. An obvious power loss in single ignition operation is evidence of spark plug or magneto trouble. Assuming that spark plugs are the more likely cause, lean the mixture to the recommended lean setting for cruising flight. If the problem does not clear up in several minutes, determine if a richer mixture setting will produce smoother operation. If not, proceed to the nearest airport for repairs using the BOTH position of the ignition switch unless extreme roughness dictates the use of a single ignition position.

MAGNETO MALFUNCTION

A sudden engine roughness or misfiring is usually evidence of magneto problems. Switching from BOTH to either L or R ignition switch position will identify which magneto is malfunctioning. Select different power settings and enrichen the mixture to determine if continued operation on BOTH magnetos is practicable. If not, switch to the good magneto and proceed to the nearest airport for repairs.

LOW OIL PRESSURE

If low oil pressure is accompanied by normal oil temperature, there is a possibility the oil pressure gage or relief valve is malfunctioning. A leak in the line to the gage is not necessarily cause for an immediate precautionary landing because an orifice in this line will prevent a sudden loss of oil from the engine sump. However, a landing at the nearest airport would be advisable to inspect the source of trouble.

If a total loss of oil pressure is accompanied by a rise in oil temperature, there is good reason to suspect an engine failure is imminent. Reduce engine power immediately and select a suitable forced landing field. Use only the minimum power required to reach the desired touchdown spot.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter and low-voltage warning light; however, the cause of these malfunctions is usually difficult to determine. A broken alternator drive belt or wiring is most likely the cause of alternator failures, although other factors could cause the problem. A defective alternator control unit can also cause malfunctions. Problems of this nature constitute an electrical emergency and should be dealt with immediately. Electrical power malfunctions usually fall into two categories: excessive rate of charge and insufficient rate of charge. The paragraphs below describe the recommended remedy for each situation.

EXCESSIVE RATE OF CHARGE

After engine starting and heavy electrical usage at low engine speeds (such as extended taxiing) the battery condition will be low enough to accept above normal charging during the initial part of a flight. However, after thirty minutes of cruising flight, the ammeter should be indicating less than two needle widths of charging current. If the charging rate were to remain above this value on a long flight, the battery would overheat and evaporate the electrolyte at an excessive rate.

Electronic components in the electrical system can be adversely affected by higher than normal voltage. The alternator control unit includes an over-voltage sensor which normally will automatically shut down the alternator if the charge voltage reaches approximately 31.5 volts. If the over-voltage sensor malfunctions, as evidenced by an excessive rate of charge shown on the ammeter, the alternator should be turned off, alternator circuit breaker pulled, nonessential electrical equipment turned off and the flight terminated as soon as practical.

INSUFFICIENT RATE OF CHARGE

NOTE

Illumination of the low-voltage light and ammeter discharge indications may occur during low RPM conditions with an electrical load on the system, such as during a low RPM taxi. Under these conditions, the light will go out at

higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system.

If the over-voltage sensor should shut down the alternator or if the alternator output is low, a discharge rate will be shown on the ammeter followed by illumination of the low-voltage warning light. Since this may be a "nuisance" trip-out, an attempt should be made to reactivate the alternator system. To do this, turn the avionics power switch off, check that the alternator circuit breaker is in, then turn both sides of the master switch off and then on again. If the problem no longer exists, normal alternator charging will resume and the low-voltage light will go off. The avionics power switch may then be turned back on. If the light illuminates again, a malfunction is confirmed. In this event, the flight should be terminated and/or the current drain on the battery minimized because the battery can supply the electrical system for only a limited period of time. If the emergency occurs at night, power must be conserved for later use of the landing lights and flaps during landing.

OTHER EMERGENCIES

WINDSHIELD DAMAGE

If a bird strike or other incident should damage the windshield in flight to the point of creating an opening, a significant loss in performance may be expected. This loss **may** be minimized **in some cases** (depending on amount of damage, altitude, etc.) by opening the side windows while the airplane is maneuvered for a landing at the nearest airport.

If airplane performance or other adverse conditions preclude landing at an airport, prepare for an "off airport" landing in accordance with the Precautionary Landing With Engine Power or Ditching checklists.

SECTION 4
NORMAL PROCEDURES

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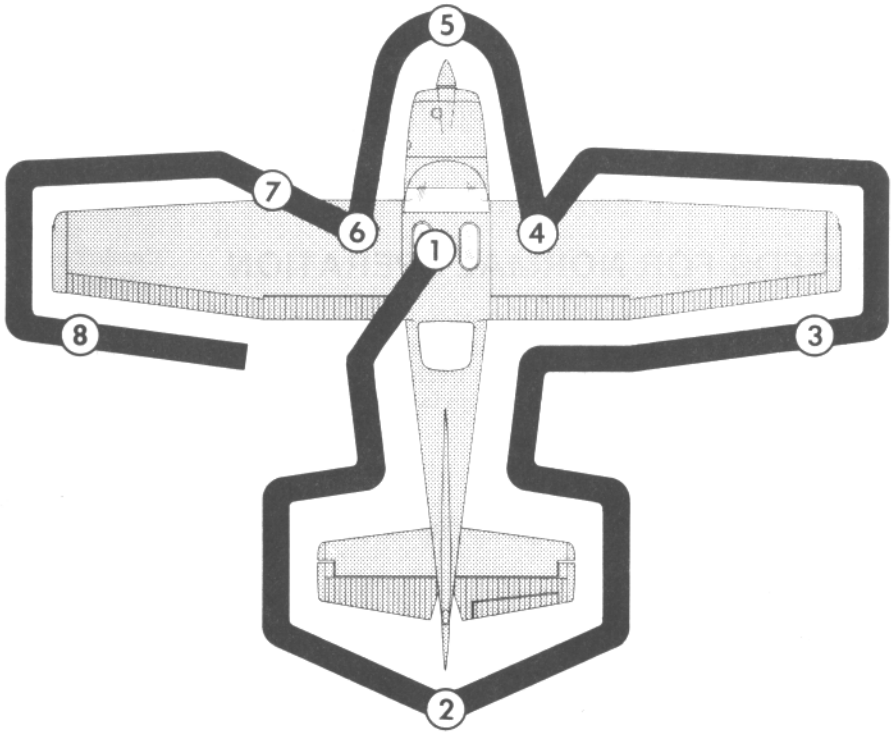
INTRODUCTION

Section 4 provides checklist and amplified procedures for the conduct of normal operation. Normal procedures associated with optional systems can be found in Section 9.

SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum takeoff weight or maximum landing weight, and may be used for any lesser weight. However, to achieve the performance specified in Section 5 for takeoff distance, the speed appropriate to the particular weight must be used.

Takeoff:	
Normal Climb Out	70-80 KIAS
Short Field Takeoff, Flaps 20°, Speed at 50 Feet	59 KIAS
Enroute Climb, Flaps Up:	
Normal	85-95 KIAS
Best Rate of Climb, Sea Level	81 KIAS
Best Rate of Climb, 10,000 Feet	75 KIAS
Best Angle of Climb, Sea Level	59 KIAS
Best Angle of Climb, 10,000 Feet	66 KIAS
Landing Approach (2950 Lbs):	
Normal Approach, Flaps Up	70-80 KIAS
Normal Approach, Flaps FULL	60-70 KIAS
Short Field Approach, Flaps FULL	61 KIAS
Balked Landing (2950 Lbs):	
Maximum Power, Flaps 20°	55 KIAS
Maximum Recommended Turbulent Air Penetration Speed:	
3100 Lbs	111 KIAS
2600 Lbs	102 KIAS
2000 Lbs	88 KIAS
Maximum Demonstrated Crosswind Velocity:	
Takeoff or Landing	15 KNOTS



NOTE

Visually check airplane for general condition during walk-around inspection. Use of the refueling steps and assist handles (if installed) will simplify access to the upper wing surfaces for visual checks and refueling operations. In cold weather, remove even small accumulations of frost, ice or snow from wing, tail and control surfaces. Also, make sure that control surfaces contain no internal accumulations of ice or debris. Prior to flight, check that pitot heater (if installed) is warm to touch within 30 seconds with battery and pitot heat switches on. If a night flight is planned, check operation of all lights, and make sure a flashlight is available.

Figure 4-1. Preflight Inspection

CHECKLIST PROCEDURES

PREFLIGHT INSPECTION

(1) CABIN

1. Pilot's Operating Handbook -- AVAILABLE IN THE AIRPLANE.
2. Parking Brake -- SET.
3. Control Wheel Lock -- REMOVE.
4. Ignition Switch -- OFF.
5. Master Switch -- ON.

WARNING

When turning on the master switch, using an external power source, or pulling the propeller through by hand, treat the propeller as if the ignition switch were on. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

6. Avionics Power Switch -- ON.
7. Avionics Cooling Fan -- CHECK AUDIBLY FOR OPERATION.
8. Avionics Power Switch -- OFF.
9. Low-Vacuum Warning Light -- CHECK ON.
10. Fuel Quantity Indicators -- CHECK QUANTITY.
11. Master Switch -- OFF.
12. Static Pressure Alternate Source Valve (if installed) -- OFF.
13. Fuel Selector Valve -- BOTH.
14. Baggage Door -- CHECK for security, lock with key if child's seat is to be occupied.

(2) EMPENNAGE

1. Rudder Gust Lock -- REMOVE.
2. Tail Tie-Down -- DISCONNECT.
3. Control Surfaces -- CHECK freedom of movement and security.

(3) RIGHT WING Trailing Edge

1. Aileron -- CHECK freedom of movement and security.

(4) RIGHT WING

1. Wing Tie-Down -- DISCONNECT.

2. Fuel Tank Vent Opening -- CHECK for stoppage.
3. Main Wheel Tire -- CHECK for proper inflation.
4. Fuel Tank Sump Quick-Drain Valve -- DRAIN at least a cupful of fuel (using sampler cup) to check for water, sediment, and proper fuel grade before first flight of day and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to ground to move any additional contaminants to the sampling points. Take repeated samples from **all** fuel drain points until all contamination has been removed.
5. Fuel Quantity -- CHECK VISUALLY for desired level.
6. Fuel Filler Cap -- SECURE and vent unobstructed.

(5) NOSE

1. Right Static Source Opening -- CHECK for stoppage.
2. Propeller and Spinner -- CHECK for nicks, security and oil leaks.
3. Engine Cooling Air Inlets -- CLEAR of obstructions.
4. Landing Lights -- CHECK for condition and cleanliness.
5. Carburetor Air Filter -- CHECK for restrictions by dust or other foreign matter.
6. Nose Wheel Strut and Tire -- CHECK for proper inflation.
7. Nose Tie-Down -- DISCONNECT.
8. Engine Oil Filler Cap -- CHECK secure.
9. Engine Oil Dipstick -- CHECK oil level, then check dipstick SECURE. Do not operate with less than nine quarts. Fill to twelve quarts for extended flight.
10. Fuel Strainer Drain Knob -- PULL OUT for at least four seconds to clear strainer of possible water and sediment before first flight of day and after each refueling. Return drain knob full in and check strainer drain CLOSED. If water is observed, perform further draining at **all** fuel drain points until clear and then gently rock wings and lower tail to ground to move any additional contaminants to the sampling points. Take repeated samples from **all** fuel drain points until all contamination has been removed.
11. Left Static Source Opening -- CHECK for stoppage.

(6) LEFT WING

1. Fuel Quantity -- CHECK VISUALLY for desired level.
2. Fuel Filler Cap -- SECURE and vent unobstructed.
3. Fuel Tank Sump Quick-Drain Valve -- DRAIN at least a cupful of fuel (using sampler cup) to check for water, sediment, and proper fuel grade before first flight of day and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from **all** fuel drain points until all contamination has been removed.

4. Main Wheel Tire -- CHECK for proper inflation.

(7) LEFT WING Leading Edge

1. Pitot Tube Cover -- REMOVE and check opening for stoppage.
2. Fuel Tank Vent Opening -- CHECK for stoppage.
3. Stall Warning Vane -- CHECK for freedom of movement while master switch is turned ON (horn should sound when vane is pushed upward).
4. Wing Tie-Down -- DISCONNECT.

(8) LEFT WING Trailing Edge

1. Aileron -- CHECK freedom of movement and security.

BEFORE STARTING ENGINE

1. Preflight Inspection -- COMPLETE.
2. Passenger Briefing -- COMPLETE.
3. Seats, Seat Belts, Shoulder Harnesses -- ADJUST and LOCK.
4. Brakes -- TEST and SET.
5. Avionics Power Switch -- OFF.

CAUTION

The avionics power switch must be OFF during engine start to prevent possible damage to avionics.

6. Electrical Equipment -- OFF.
7. Circuit Breakers -- CHECK IN.
8. Autopilot (if installed) -- OFF.
9. Cowl Flaps -- OPEN (move lever out of locking hole to reposition).
10. Fuel Selector Valve -- BOTH.

STARTING ENGINE

1. Prime -- AS REQUIRED.
2. Carburetor Heat -- COLD.
3. Throttle -- OPEN 1/2 INCH.
4. Propeller -- HIGH RPM.
5. Mixture -- RICH.
6. Propeller Area -- CLEAR.
7. Master Switch -- ON.
8. Ignition Switch -- START (release when engine starts).

NOTE

If engine has been overprimed, start with throttle 1/4 to 1/2 open. Reduce throttle to idle when engine fires.

9. Oil Pressure -- CHECK.
10. Starter -- CHECK DISENGAGED (if starter were to remain engaged, ammeter would indicate full-scale charge with engine running at 1000 RPM).
11. Avionics Power Switch -- ON.
12. Navigation Lights and Flashing Beacon -- ON as required.
13. Radios -- ON.

BEFORE TAKEOFF

1. Parking Brake -- SET.
2. Seats, Seat Belts, Shoulder Harnesses -- CHECK SECURE.
3. Cabin Doors -- CLOSED and LOCKED.
4. Flight Controls -- FREE and CORRECT.
5. Flight Instruments -- CHECK and SET.

CAUTION

The directional indicator should be rechecked during engine runup to avoid compass deviation errors which may occur below 1200 RPM.

6. Primer -- LOCKED.
7. Fuel Quantity -- CHECK.
8. Mixture -- RICH.
9. Fuel Selector Valve -- RECHECK BOTH.
10. Elevator and Rudder Trim -- SET for takeoff.
11. Throttle -- 1700 RPM.
    a. Magnetos -- CHECK (RPM drop should not exceed 150 RPM on either magneto or 50 RPM differential between magnetos).
    b. Carburetor Heat -- CHECK (for RPM drop).
    c. Propeller -- CYCLE from high to low RPM; return to high RPM (full in).
    d. Suction Gage -- CHECK.
    e. Engine Instruments and Ammeter -- CHECK.
12. Throttle -- 800 - 1000 RPM.
13. Throttle Friction Lock -- ADJUST.
14. Electric Trim (if installed) -- PREFLIGHT TEST (See Section 9).
15. Strobe Lights (if installed) -- AS DESIRED.
16. Radios and Avionics -- SET.
17. Autopilot (if installed) -- OFF.
18. Wing Flaps -- SET for takeoff (see Takeoff checklists).
19. Cowl Flaps -- OPEN.
20. Parking Brake -- RELEASE.

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps -- 0° - 20° .
2. Carburetor Heat -- COLD.
3. Power -- FULL THROTTLE and 2400 RPM.
4. Mixture -- FULL RICH (mixture may be leaned above 5000 feet for smooth operation).
5. Elevator Control -- LIFT NOSE WHEEL at 50 KIAS.
6. Climb Speed -- 70 KIAS (flaps 20°).
   80 KIAS (flaps UP).
7. Wing Flaps -- RETRACT.

SHORT FIELD TAKEOFF

1. Wing Flaps -- 20°.
2. Carburetor Heat -- COLD.
3. Brakes -- APPLY.
4. Power -- FULL THROTTLE and 2400 RPM.
5. Mixture -- FULL RICH (mixture may be leaned above 5000 feet for smooth operation).
6. Brakes -- RELEASE.
7. Elevator Control -- MAINTAIN SLIGHTLY TAIL LOW ATTITUDE.
8. Climb Speed -- 59 KIAS (until all obstacles are cleared).
9. Wing Flaps -- RETRACT slowly after reaching 70 KIAS.

ENROUTE CLIMB

NORMAL CLIMB

1. Airspeed -- 85-95 KIAS.
2. Power -- 23 INCHES Hg or FULL THROTTLE (whichever is less) and 2400 RPM.
3. Fuel Selector Valve -- BOTH.
4. Mixture -- FULL RICH (mixture may be leaned above 5000 feet for smooth engine operation).
5. Cowl Flaps -- OPEN as required.

MAXIMUM PERFORMANCE CLIMB

1. Airspeed -- 81 KIAS at sea level to 75 KIAS at 10,000 feet.
2. Power -- FULL THROTTLE and 2400 RPM.
3. Fuel Selector Valve -- BOTH.

4. Mixture -- FULL RICH (mixture may be leaned above 5000 feet for smooth engine operation).
5. Cowl Flaps -- FULL OPEN.

CRUISE

1. Power -- 15-23 INCHES Hg, 2100-2400 RPM (no more than 75% power).
2. Elevator and Rudder Trim -- ADJUST.
3. Mixture -- LEAN.
4. Cowl Flaps -- CLOSED.

DESCENT

1. Fuel Selector Valve -- BOTH.
2. Power -- AS DESIRED.
3. Mixture -- ENRICHEN as required.
4. Carburetor Heat -- FULL HEAT AS REQUIRED to prevent carburetor icing.
5. Cowl Flaps -- CLOSED.
6. Wing Flaps -- AS DESIRED (0° - 10° below 140 KIAS, 10° - 20° below 120 KIAS, 20° - FULL below 95 KIAS).

BEFORE LANDING

1. Seats, Seat Belts, Shoulder Harnesses -- SECURE.
2. Fuel Selector Valve -- BOTH.
3. Mixture -- RICH.
4. Propeller -- HIGH RPM.
5. Carburetor Heat -- ON (apply full heat before reducing power).
6. Autopilot (if installed) -- OFF.

LANDING

NORMAL LANDING

1. Airspeed -- 70-80 KIAS (flaps UP).
2. Wing Flaps -- AS DESIRED (0° - 10° below 140 KIAS, 10° - 20° below 120 KIAS, 20° - FULL below 95 KIAS).
3. Airspeed -- 60-70 KIAS (flaps DOWN).
4. Trim -- ADJUST.
5. Touchdown -- MAIN WHEELS FIRST.
6. Landing Roll -- LOWER NOSE WHEEL GENTLY.
7. Braking -- MINIMUM REQUIRED.

SHORT FIELD LANDING

1. Airspeed -- 70-80 KIAS (flaps UP).
2. Wing Flaps -- FULL (below 95 KIAS).
3. Airspeed -- MAINTAIN 61 KIAS.
4. Trim -- ADJUST.
5. Power -- REDUCE to idle as obstacle is cleared.
6. Touchdown -- MAIN WHEELS FIRST.
7. Brakes -- APPLY HEAVILY.
8. Wing Flaps -- RETRACT for maximum brake effectiveness.

BALKED LANDING

1. Power -- FULL THROTTLE and 2400 RPM.
2. Carburetor Heat -- COLD.
3. Wing Flaps -- RETRACT to 20°.
4. Climb Speed -- 55 KIAS.
5. Wing Flaps -- RETRACT slowly after reaching 70 KIAS.
6. Cowl Flaps -- OPEN.

AFTER LANDING

1. Carburetor Heat -- COLD.
2. Wing Flaps -- UP.
3. Cowl Flaps -- OPEN.

SECURING AIRPLANE

1. Parking Brake -- SET.
2. Throttle -- IDLE.
3. Avionics Power Switch, Electrical Equipment -- OFF.
4. Mixture -- IDLE CUT-OFF (pulled full out).
5. Ignition Switch -- OFF.
6. Master Switch -- OFF.
7. Control Lock -- INSTALL.
8. Cowl Flaps -- CLOSE.
9. Fuel Selector Valve -- RIGHT or LEFT to prevent crossfeeding.

AMPLIFIED PROCEDURES

PREFLIGHT INSPECTION

The Preflight Inspection, described in figure 4-1 and adjacent checklist, is recommended for the first flight of the day. Inspection procedures for subsequent flights are normally limited to brief checks of control surface hinges, fuel and oil quantity, and security of fuel and oil filler caps and draining of the fuel strainer, and fuel tank sumps. If the airplane has been in extended storage, has had recent major maintenance, or has been operated from marginal airports, a more extensive exterior inspection is recommended.

After major maintenance has been performed, the flight and trim tab controls should be double-checked for free and correct movement and security. The security of all inspection plates on the airplane should be checked following periodic inspections. If the airplane has been waxed or polished, check the external static pressure source holes for stoppage.

If the airplane has been exposed to much ground handling in a crowded hangar, it should be checked for dents and scratches on wings, fuselage, and tail surfaces, as well as damage to navigation and anti-collision lights, and avionics antennas.

Outside storage for long periods may result in dust and dirt accumulation on the induction air filter, obstructions in airspeed system lines, and condensation in fuel tanks. If any water is detected in the fuel system, the fuel tank sump quick-drain valves, fuel selector valve drain, and fuel strainer drain should all be thoroughly drained again. Then, the wings should be gently rocked and the tail lowered to the ground to move any further contaminants to the sampling points. Repeated samples should be taken from all drain points until all contamination has been removed. If, after repeated sampling, evidence of contamination still exists, the fuel tanks should be completely drained and the fuel system cleaned. Outside storage in windy or gusty areas, or tie-down adjacent to taxiing airplanes, calls for special attention to control surface stops, hinges, and brackets to detect the presence of wind damage.

If the airplane has been operated from muddy fields or in snow or slush, check the main and nose gear wheel fairings for obstructions and cleanliness. Operation from a gravel or cinder field will require extra attention to propeller tips and abrasion on leading edges of the horizontal tail. Stone damage to the propeller can seriously reduce the fatigue life of the blades.

Airplanes that are operated from rough fields, especially at high altitudes, are subjected to abnormal landing gear abuse. Frequently check all components of the landing gear, shock strut, tires, and brakes. If the

shock strut is insufficiently extended, undue landing and taxi loads will be subjected on the airplane structure.

To prevent loss of fuel in flight, make sure the fuel tank filler caps are tightly sealed after any fuel system check or servicing. Fuel system vents should also be inspected for obstructions, ice or water, especially after exposure to cold, wet weather.

STARTING ENGINE

Ordinarily the engine starts easily with one or two strokes of the primer in warm temperatures to six strokes in cold weather with the throttle open approximately 1/2 inch. In extremely cold temperatures, it may be necessary to continue priming while cranking. Weak intermittent firing followed by puffs of black smoke from the exhaust stack indicates overpriming or flooding. Excess fuel can be cleared from the combustion chambers by the following procedure: Set the mixture control full lean and the throttle full open; then crank the engine through several revolutions with the starter. Repeat the starting procedure without any additional priming.

If the engine is underprimed (most likely in cold weather with a cold engine) it will not fire at all. Additional priming will be necessary for the next starting attempt. As soon as the cylinders begin to fire, open the throttle slightly to keep it running.

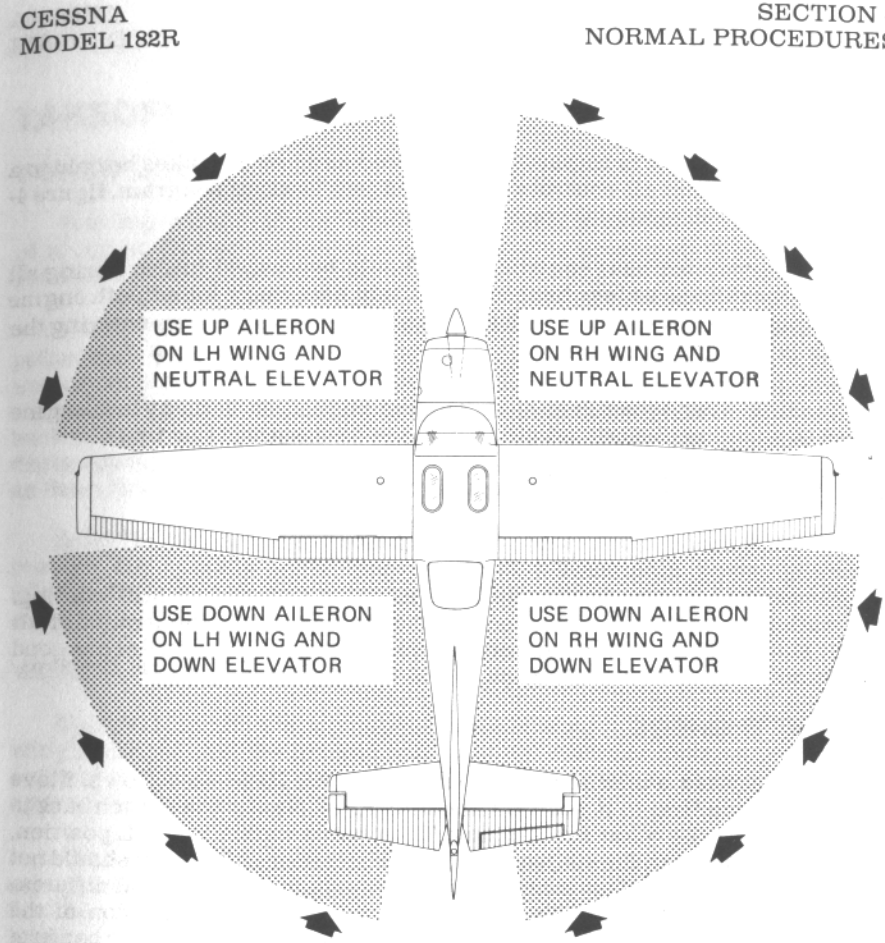
If prolonged cranking is necessary, allow the starter motor to cool at frequent intervals, since excessive heat may damage the armature.

After starting, if the oil gage does not begin to show pressure within 30 seconds in the summertime and about twice that long in very cold weather, stop engine and investigate. Lack of oil pressure can cause serious engine damage. After starting, avoid the use of carburetor heat unless icing conditions prevail.

NOTE

Additional details concerning cold weather starting and operation may be found under COLD WEATHER OPERATION paragraphs in this section.

After the completion of normal engine starting procedures, it is a good practice to verify that the engine starter has disengaged. If the starter contactor were to stick closed, causing the starter to remain engaged, an excessively high charge indication (full scale at 1000 RPM) would be evident on the ammeter. In this event, immediately shut down the engine and take corrective action prior to flight.



NOTE

Strong quartering tail winds require caution. Avoid sudden bursts of the throttle and sharp braking when the airplane is in this attitude. Use the steerable nose wheel and rudder to maintain direction.

Figure 4-2. Taxiing Diagram

TAXIING

When taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized (see Taxiing Diagram, figure 4-2) to maintain directional control and balance.

The carburetor heat control knob should be pushed full in during all ground operations unless heat is absolutely necessary for smooth engine operation. When the knob is pulled out to the heat position, air entering the engine is not filtered.

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.

BEFORE TAKEOFF

WARM-UP

Since the engine is closely cowled for efficient in-flight cooling, precautions should be taken to avoid overheating on the ground. Full power checks on the ground are not recommended unless the pilot has good reason to suspect that the engine is not turning up properly.

MAGNETO CHECK

The magneto check should be made at 1700 RPM as follows. Move ignition switch first to R position and note RPM. Next move switch back to BOTH to clear the other set of plugs. Then move switch to the L position, note RPM and return the switch to the BOTH position. RPM drop should not exceed 150 RPM on either magneto or show greater than 50 RPM differential between magnetos. If there is a doubt concerning operation of the ignition system, RPM checks at higher engine speeds will usually confirm whether a deficiency exists.

An absence of RPM drop may be an indication of faulty grounding of one side of the ignition system or should be cause for suspicion that the magneto timing is set in advance of the setting specified.

ALTERNATOR CHECK

Prior to flights where verification of proper alternator and alternator control unit operation is essential (such as night or instrument flights), a positive verification can be made by loading the electrical system momentarily (3 to 5 seconds) with the landing light during the engine runup (1700 RPM). The ammeter will remain within a needle width of the initial reading if the alternator and alternator control unit are operating properly.

TAKEOFF

POWER CHECK

It is important to check takeoff power early in the takeoff roll. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the takeoff.

Full power runups over loose gravel are especially harmful to propeller tips. When takeoffs must be made over a gravel surface, it is very important that the throttle be advanced slowly. This allows the airplane to start rolling before high RPM is developed, and the gravel will be blown back of the propeller rather than pulled into it. When unavoidable small dents appear in the propeller blades they should be corrected immediately as described in Section 8 under Propeller Care.

After full power is applied, adjust the throttle friction lock clockwise to prevent the throttle from creeping from a maximum power position. Similar friction lock adjustment should be made as required in other flight conditions to maintain a fixed throttle setting.

WING FLAP SETTINGS

Normal takeoffs are accomplished with wing flaps 0° to 20°. Using 20° wing flaps reduces the ground roll and total distance over an obstacle by approximately 20 per cent. Flap deflections greater than 20° are not approved for takeoff.

If 20° wing flaps are used for takeoff, they should be left down until all obstacles are cleared and a safe flap retraction speed of 70 KIAS is reached. To clear an obstacle with wing flaps 20°, an obstacle clearance speed of 59 KIAS should be used.

Soft field takeoffs are performed with 20° flaps by lifting the airplane off the ground as soon as practical in a slightly tail-low attitude. If no obstacles are ahead, the airplane should be leveled off immediately to accelerate to a safer climb speed.

With wing flaps retracted and no obstructions ahead, a climb-out speed of 80 KIAS would be most efficient.

CROSSWIND TAKEOFF

Takeoffs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after takeoff. With the ailerons partially deflected into the wind, the airplane is accelerated to a speed slightly higher than

normal, and then pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

ENROUTE CLIMB

Normal climbs are performed at 85-95 KIAS with flaps up, 23 In. Hg. or full throttle (whichever is less) and 2400 RPM for the best combination of engine cooling, rate of climb and forward visibility. If it is necessary to climb rapidly to clear mountains or reach favorable winds at high altitudes, the best rate-of-climb speed should be used with maximum power. This speed is 81 KIAS at sea level, decreasing to 75 KIAS at 10,000 feet.

If an obstruction ahead requires a steep climb angle, a best angle-of-climb speed should be used with flaps up and maximum power. This speed is 59 KIAS at sea level, increasing to 66 KIAS at 10,000 feet.

The mixture should be full rich during climb at altitudes up to 5000 feet. Above 5000 feet, the mixture may be leaned for smooth engine operation and increased power.

CRUISE

Normal cruising is performed between 55% and 75% power. The corresponding power settings and fuel consumption for various altitudes can be determined by using your Cessna Power Computer or the data in Section 5.

NOTE

Cruising should be done at 75% power as much as practicable until a total of 50 hours has accumulated or oil consumption has stabilized. This is to ensure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

The Cruise Performance Table, figure 4-3, illustrates the true airspeed and nautical miles per gallon during cruise for various altitudes and percent powers. This table should be used as a guide, along with the available winds aloft information, to determine the most favorable altitudes and power setting for a given trip. The selection of cruise altitude on the basis

	75% POWER		65% POWER		55% POWER	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
4000 Feet	137	10.6	129	11.6	118	12.5
6000 Feet	139	10.8	131	11.8	120	12.6
8000 Feet	142	11.0	133	12.0	121	12.8
10,000 Feet	- - -	- - -	135	12.2	123	13.0
Standard Conditions						Zero Wind

Figure 4-3. Cruise Performance Table

of the most favorable wind conditions and the use of low power settings are significant factors that should be considered on every trip to reduce fuel consumption.

For reduced noise levels, it is desirable to select the lowest RPM in the green arc range for a given percent power that will provide smooth engine operation. The cowl flaps should be opened, if necessary, to maintain the cylinder head temperature at approximately two-thirds of the normal operating range (green arc).

Cruise performance data in this handbook and on the power computer is based on a recommended lean mixture setting which may be established as follows:

1. Lean the mixture until the engine becomes rough.
2. Enrichen the mixture to obtain smooth engine operation; then further enrichen an equal amount.

For best fuel economy at 65% power or less, the engine may be operated at the leanest mixture that results in smooth engine operation. This will result in approximately 5% greater range than shown in this handbook accompanied by approximately a 3 knot decrease in speed.

Any change in altitude, power or carburetor heat will require a change in the recommended lean mixture setting and a recheck of the EGT setting (if installed).

Carburetor ice, as evidenced by an unexplained drop in manifold pressure, can be removed by application of full carburetor heat. Upon regaining the original manifold pressure indication (with heat off), use the minimum amount of heat (by trial and error) to prevent ice from forming. Since the heated air causes a richer mixture, readjust the mixture setting

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE
RECOMMENDED LEAN (Pilot's Operating Handbook and Power Computer)	50°F Rich of Peak EGT
BEST ECONOMY (65% Power or Less)	Peak EGT

Figure 4-4. EGT Table

when carburetor heat is to be used continuously in cruise flight.

The use of full carburetor heat is recommended during flight in very heavy rain to avoid the possibility of engine stoppage due to excessive water ingestion. The mixture setting should be readjusted for smoothest operation.

LEANING WITH A CESSNA ECONOMY MIXTURE INDICATOR (EGT)

Exhaust gas temperature (EGT) as shown on the optional Cessna Economy Mixture Indicator may be used as an aid for mixture leaning in cruising flight at 75% power or less. To adjust the mixture, using this indicator, lean to establish the peak EGT as a reference point and then enrichen the mixture by a desired increment based on data in figure 4-4.

Continuous operation at peak EGT is authorized only at 65% power or less. This best economy mixture setting results in approximately 5% greater range than shown in this handbook accompanied by approximately a 3 knot decrease in speed.

NOTE

Operation on the lean side of peak EGT is not approved.

When leaning the mixture under some conditions, engine roughness may occur before peak EGT is reached. In this case, use the EGT corresponding to the onset of roughness as the reference point instead of peak EGT.

STALLS

The stall characteristics are conventional and aural warning is

provided by a stall warning horn which sounds between 5 and 10 knots above the stall in all configurations.

Power-off stall speeds at maximum weight for both forward and aft C.G. are presented in Section 5.

LANDING

NORMAL LANDING

Landings should be made on the main wheels first to reduce the landing speed and the subsequent need for braking in the landing roll. The nose wheel is lowered gently to the runway after the speed has diminished to avoid unnecessary nose gear load. This procedure is especially important in rough field landings.

SHORT FIELD LANDING

For a short field landing, make a power-off approach at 61 KIAS with full flaps and land on the main wheels first. Immediately after touchdown, lower the nose gear to the ground and apply heavy braking as required. For maximum brake effectiveness after all three wheels are on the ground, retract the flaps, hold full nose up elevator and apply maximum possible brake pressure without sliding the tires.

CROSSWIND LANDING

When landing in a strong crosswind, use the minimum flap setting required for the field length. Although the crab or combination method of drift correction may be used, the wing-low method gives the best control. After touchdown, hold a straight course with the steerable nose wheel and occasional braking if necessary.

BALKED LANDING

In a balked landing (go-around) climb, the wing flap setting should be reduced to 20° immediately after full power is applied. After all obstacles are cleared and a safe altitude and airspeed are obtained, the wing flaps should be retracted.

COLD WEATHER OPERATION

Special consideration should be given to the operation of the airplane fuel system during the winter season or prior to any flight in cold temperatures. Proper preflight draining of the fuel system is especially important

TEMPERATURE CONVERSION CHART

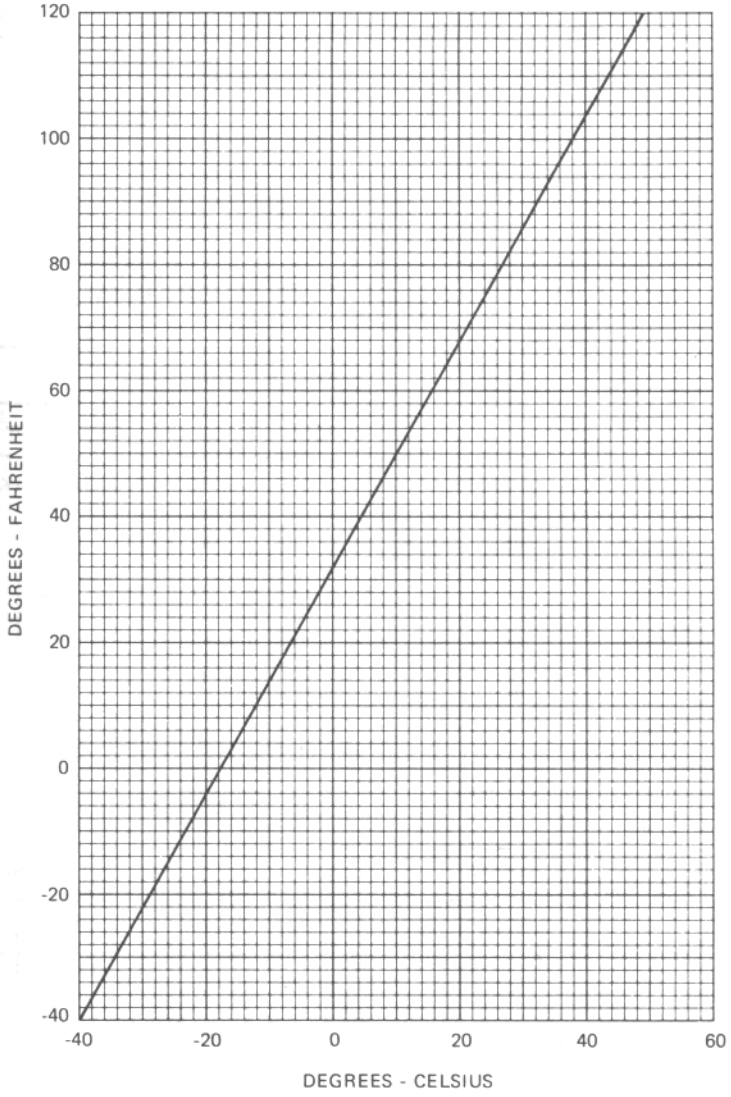


Figure 5-2. Temperature Conversion Chart

WIND COMPONENTS

NOTE:
Maximum demonstrated crosswind velocity is 15 knots (not a limitation).

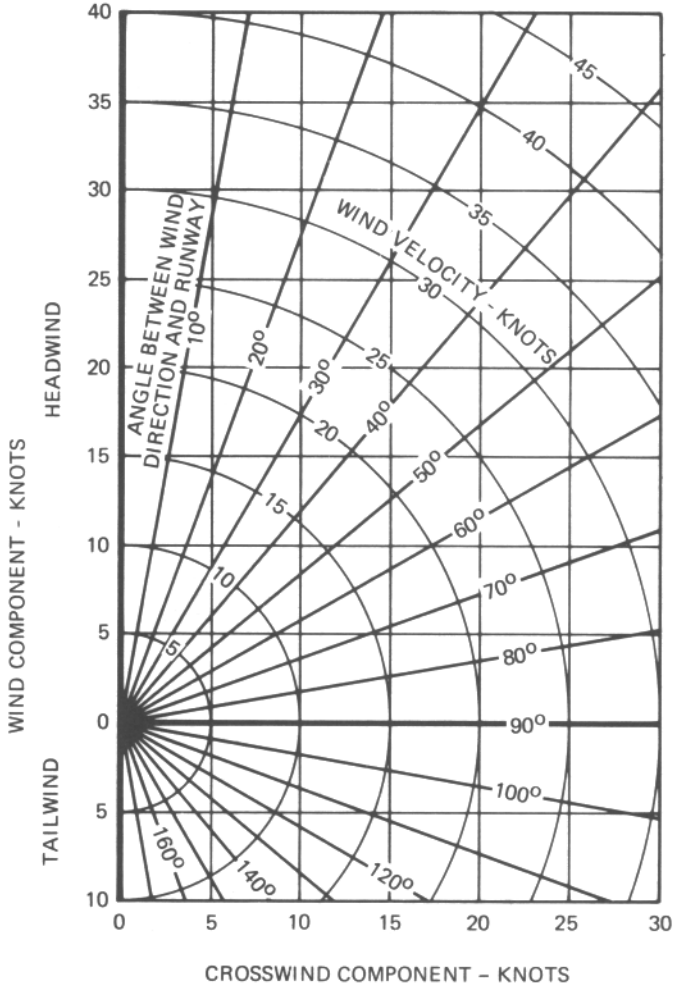


Figure 5-4. Wind Components

TAKEOFF DISTANCE

MAXIMUM WEIGHT 3100 LBS

SHORT FIELD

CONDITIONS:
Flaps 20°
2400 RPM, Full Throttle and Mixture Set Prior to Brake Release
Cowl Flaps Open
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 5000 feet elevation, the mixture should be leaned to give maximum power in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
4. Where distance value has been deleted, climb performance after lift-off is less than 150 fpm at takeoff speed.
5. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
3100	50	59	S.L.	720	1365	775	1465	835	1570	895	1680	955	1800
			1000	785	1490	845	1600	910	1720	975	1845	1045	1980
			2000	860	1635	925	1760	995	1890	1065	2035	1140	2185
			3000	940	1800	1010	1940	1085	2090	1165	2255	1250	2430
			4000	1025	1990	1105	2150	1190	2320	1275	2510	1370	2715
			5000	1125	2210	1215	2395	1305	2595	1400	2815	1505	3060
			6000	1235	2470	1330	2685	1435	2925	1540	3190	1655	3490
			7000	1360	2780	1465	3040	1580	3330	1700	3665	- - -	- - -
			8000	1500	3170	1615	3485	1740	3855	- - -	- - -	- - -	- - -

Figure 5-5. Takeoff Distance (Sheet 1 of 2)

TAKEOFF DISTANCE

2800 LBS AND 2500 LBS

SHORT FIELD

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
2800	48	56	S.L.	575	1080	615	1155	660	1235	710	1320	760	1410
			1000	625	1175	670	1260	720	1350	770	1440	825	1540
			2000	680	1285	730	1375	785	1475	840	1580	900	1690
			3000	740	1405	800	1505	855	1615	920	1735	985	1860
			4000	810	1540	870	1655	935	1780	1005	1910	1075	2050
			5000	885	1695	955	1825	1025	1965	1100	2115	1180	2280
			6000	970	1875	1045	2025	1125	2185	1210	2355	1295	2545
			7000	1070	2085	1150	2255	1235	2440	1330	2640	1425	2865
			8000	1175	2330	1265	2525	1360	2745	1465	2990	1570	3265
2500	45	53	S.L.	445	845	475	900	510	960	545	1020	585	1085
			1000	485	915	520	975	555	1040	595	1110	635	1185
			2000	525	995	565	1060	605	1135	650	1210	695	1290
			3000	570	1080	615	1155	660	1235	705	1320	755	1410
			4000	625	1180	670	1265	720	1350	770	1445	825	1545
			5000	680	1290	735	1385	790	1480	845	1590	905	1700
			6000	745	1415	805	1520	860	1630	925	1750	990	1875
			7000	820	1560	880	1675	945	1800	1015	1935	1085	2080
			8000	900	1725	965	1855	1040	2000	1115	2155	1195	2320

Figure 5-5. Takeoff Distance (Sheet 2 of 2)

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
2400 RPM
Full Throttle
Mixture Full Rich
Cowl Flaps Open

NOTE:
Mixture may be leaned above 5000 feet for smooth engine operation and increased power.

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
3100	S.L.	81	1010	925	845	765
	2000	80	885	805	730	650
	4000	78	760	685	610	540
	6000	77	640	570	495	425
	8000	76	520	450	380	310
	10,000	75	405	335	265	- - -
	12,000	73	285	220	155	- - -
	14,000	72	170	105	- - -	- - -

Figure 5-6. Maximum Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
2400 RPM
Full Throttle
Mixture Full Rich
Cowl Flaps Open
Standard Temperature

NOTES:
1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture may be leaned above 5000 feet for smooth engine operation and increased power.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
4. Distances shown are based on zero wind.

WEIGHT LBS	PRESSURE ALTITUDE FT	TEMP °C	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
					TIME MIN	FUEL USED GALLONS	DISTANCE NM
3100	S.L.	15	81	865	0	0	0
	2000	11	80	760	2	0.8	3
	4000	7	78	660	5	1.7	7
	6000	3	77	555	9	2.7	12
	8000	- 1	76	455	13	3.9	18
	10,000	- 5	75	350	18	5.3	25
	12,000	- 9	73	250	25	7.1	36
	14,000	-13	72	145	35	9.7	52

Figure 5-7. Time, Fuel, and Distance to Climb (Sheet 1 of 2)

TIME, FUEL, AND DISTANCE TO CLIMB

NORMAL CLIMB - 90 KIAS

CONDITIONS:
Flaps Up
2400 RPM
23 Inches Hg or Full Throttle
Mixture Full Rich
Cowl Flaps Open
Standard Temperature

NOTES:
1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture may be leaned above 5000 feet for smooth engine operation and increased power.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
4. Distances shown are based on zero wind.

WEIGHT LBS	PRESSURE ALTITUDE FT	TEMP °C	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED GALLONS	DISTANCE NM
3100	S.L.	15	540	0	0	0
	2000	11	540	4	1.0	6
	4000	7	540	7	2.1	11
	6000	3	510	11	3.2	17
	8000	- 1	395	16	4.5	25
	10,000	- 5	285	22	6.1	35

Figure 5-7. Time, Fuel, and Distance to Climb (Sheet 2 of 2)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 2000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -9°C			STANDARD TEMPERATURE 11°C			20°C ABOVE STANDARD TEMP 31°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	22	77	132	13.1	74	133	12.6	71	134	12.2
	21	72	129	12.3	69	130	11.8	67	131	11.4
	20	67	126	11.5	65	126	11.1	63	127	10.7
	19	62	122	10.7	60	122	10.3	58	122	10.0
2300	23	78	133	13.3	75	134	12.8	72	135	12.4
	22	73	130	12.5	70	131	12.0	68	131	11.6
	21	68	126	11.7	66	127	11.3	64	128	10.9
	20	64	123	10.9	62	123	10.5	60	123	10.2
2200	23	73	130	12.5	70	131	12.0	68	131	11.6
	22	69	127	11.7	66	127	11.3	64	128	10.9
	21	64	123	11.0	62	124	10.6	60	124	10.2
	20	60	119	10.2	58	120	9.9	56	120	9.6
2100	23	68	126	11.6	66	127	11.2	64	127	10.8
	22	64	123	10.9	62	123	10.5	60	124	10.2
	21	60	119	10.2	58	120	9.9	56	120	9.6
	20	56	115	9.6	54	115	9.3	52	115	9.0
	19	52	111	9.0	50	110	8.7	48	109	8.5
	18	47	106	8.4	46	105	8.1	44	103	7.9

Figure 5-8. Cruise Performance (Sheet 1 of 7)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 4000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMPERATURE 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	22	- - -	- - -	- - -	76	137	13.0	73	138	12.5
	21	74	133	12.6	71	134	12.1	69	134	11.7
	20	69	129	11.8	66	130	11.3	64	130	11.0
	19	64	125	10.9	62	126	10.6	60	126	10.2
2300	23	- - -	- - -	- - -	76	138	13.1	74	139	12.6
	22	75	133	12.8	72	134	12.3	70	135	11.9
	21	70	130	12.0	68	131	11.5	65	131	11.2
	20	66	126	11.2	63	127	10.8	61	127	10.4
2200	23	75	133	12.8	72	134	12.3	70	135	11.9
	22	70	130	12.0	68	131	11.6	66	131	11.2
	21	66	127	11.3	64	127	10.9	61	127	10.5
	20	62	123	10.5	59	123	10.2	57	123	9.8
2100	23	70	130	11.9	67	131	11.5	65	131	11.1
	22	66	126	11.2	63	127	10.8	61	127	10.4
	21	62	123	10.5	59	123	10.1	57	123	9.8
	20	57	119	9.8	55	119	9.5	53	118	9.3
	19	53	114	9.2	51	114	8.9	50	113	8.7
	18	49	109	8.6	47	108	8.3	46	106	8.1
	17	45	103	8.0	43	101	7.8	42	100	7.6

Figure 5-8. Cruise Performance (Sheet 2 of 7)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 6000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -17°C			STANDARD TEMPERATURE 3°C			20°C ABOVE STANDARD TEMP 23°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	22	- - -	- - -	- - -	77	141	13.3	75	142	12.8
	21	75	136	12.9	73	137	12.4	70	138	12.0
	20	71	133	12.1	68	133	11.6	66	134	11.2
	19	66	129	11.2	64	129	10.8	61	129	10.5
2300	22	77	137	13.1	74	138	12.6	71	139	12.2
	21	72	134	12.3	69	134	11.8	67	135	11.4
	20	67	130	11.5	65	130	11.1	63	131	10.7
	19	63	126	10.7	60	126	10.3	58	126	10.0
2200	22	72	134	12.3	69	135	11.9	67	135	11.5
	21	68	130	11.6	65	131	11.1	63	131	10.8
	20	63	126	10.8	61	127	10.4	59	127	10.1
	19	59	122	10.1	57	122	9.7	55	121	9.5
2100	22	67	130	11.5	65	131	11.1	63	131	10.7
	21	63	126	10.8	61	127	10.4	59	127	10.1
	20	59	122	10.1	57	122	9.8	55	122	9.5
	19	55	118	9.5	53	117	9.2	51	116	8.9
	18	51	113	8.8	49	111	8.6	47	110	8.3
	17	47	107	8.2	45	105	8.0	43	103	7.8

Figure 5-8. Cruise Performance (Sheet 3 of 7)

RANGE PROFILE
45 MINUTES RESERVE
65 GALLONS USABLE FUEL

CONDITIONS:
3100 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

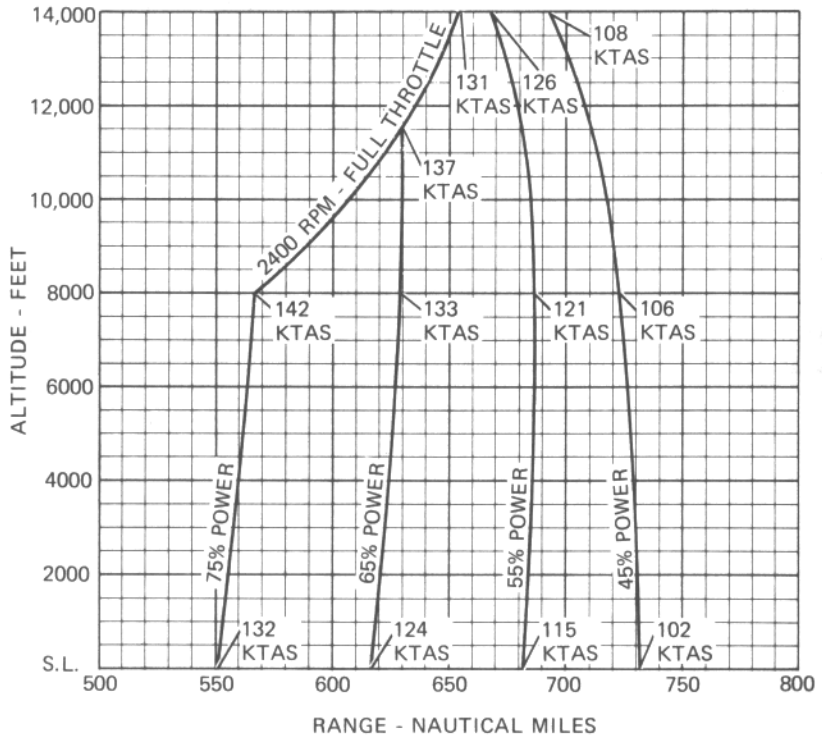


Figure 5-9. Range Profile (Sheet 1 of 2)

RANGE PROFILE
45 MINUTES RESERVE
88 GALLONS USABLE FUEL

CONDITIONS:
3100 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

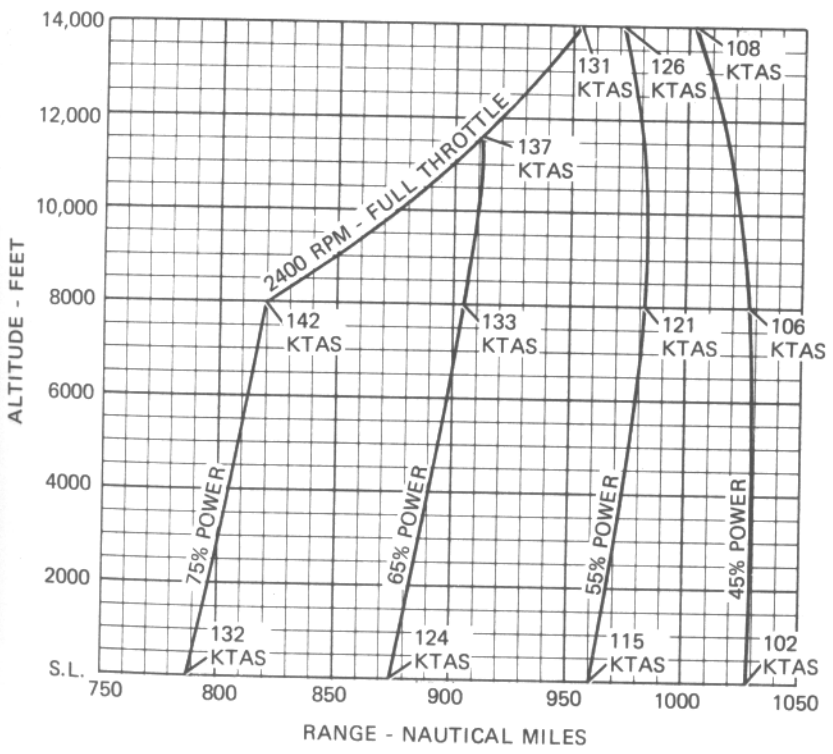


Figure 5-9. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
65 GALLONS USABLE FUEL

CONDITIONS:
3100 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

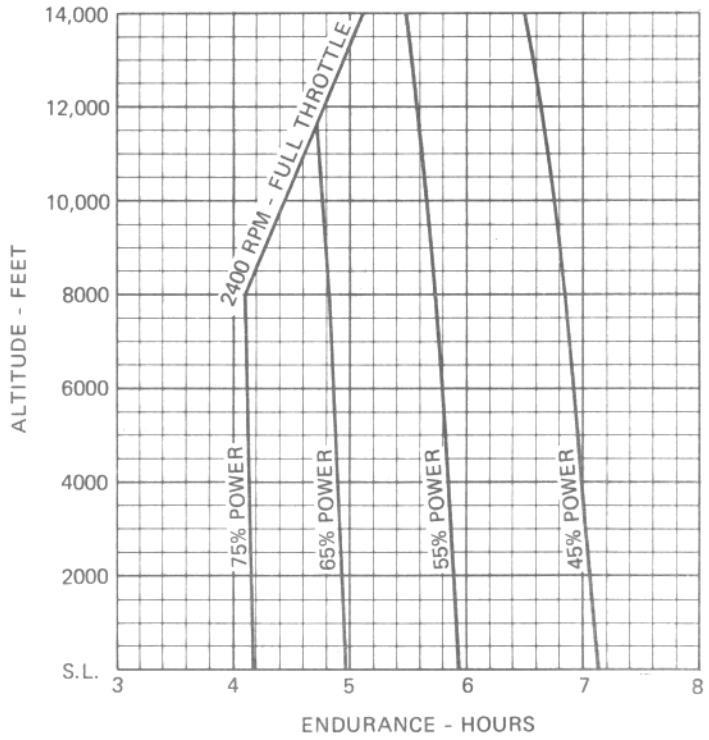


Figure 5-10. Endurance Profile (Sheet 1 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
88 GALLONS USABLE FUEL

CONDITIONS:
3100 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

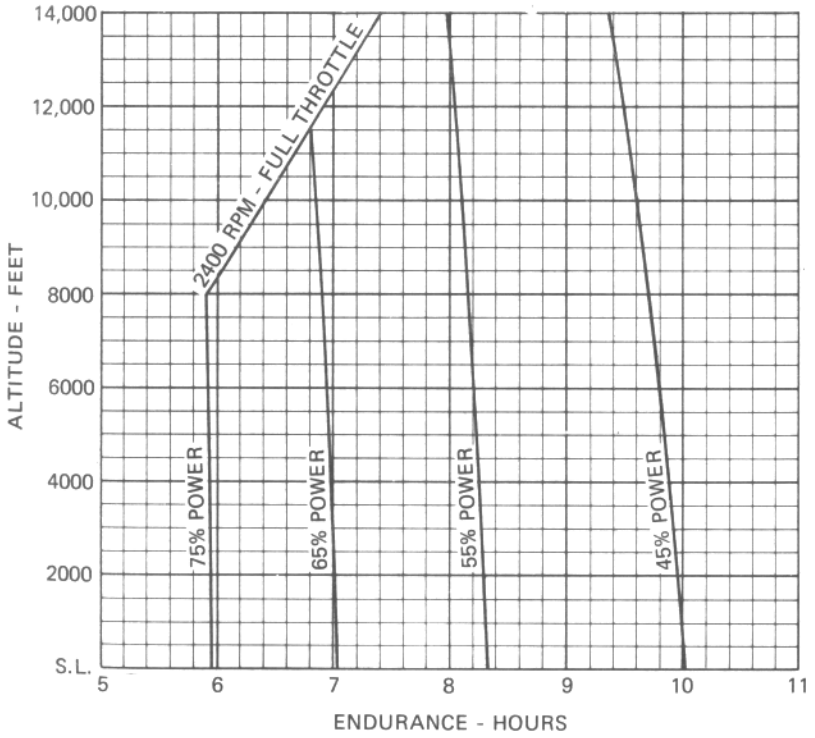


Figure 5-10. Endurance Profile (Sheet 2 of 2)

LANDING DISTANCE

SHORT FIELD

CONDITIONS:
Flaps FULL
Power Off
Maximum Braking
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
3. For operation on a dry, grass runway, increase distances by 40% of the "ground roll" figure.
4. If a landing with flaps up is necessary, increase the approach speed by 10 KIAS and allow for 40% longer distances.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
2950	61	S.L.	560	1300	580	1335	600	1365	620	1400	640	1435
		1000	580	1335	600	1365	620	1400	645	1440	665	1475
		2000	600	1370	625	1405	645	1440	670	1480	690	1515
		3000	625	1410	645	1445	670	1485	695	1525	715	1560
		4000	650	1450	670	1485	695	1525	720	1565	740	1600
		5000	670	1485	695	1525	720	1565	745	1610	770	1650
		6000	700	1530	725	1575	750	1615	775	1660	800	1700
		7000	725	1575	750	1615	780	1665	805	1710	830	1750
		8000	755	1625	780	1665	810	1715	835	1760	865	1805

Figure 5-11. Landing Distance

and baggage area can be figured on the Loading Graph using the lines labeled 2nd Row Passengers or Cargo and/or Baggage or Passengers on Child's Seat.

LOADING ARRANGEMENTS

*Pilot or passenger center of gravity on adjustable seats positioned for average occupant. Numbers in parentheses indicate forward and aft limits of occupant center of gravity range.

**Arms measured to the center of the areas shown.

NOTES:
1. The usable fuel C.G. arm is located at station 46.5.
2. The aft baggage wall (approximate station 134) can be used as a convenient interior reference point for determining the location of baggage area fuselage stations.

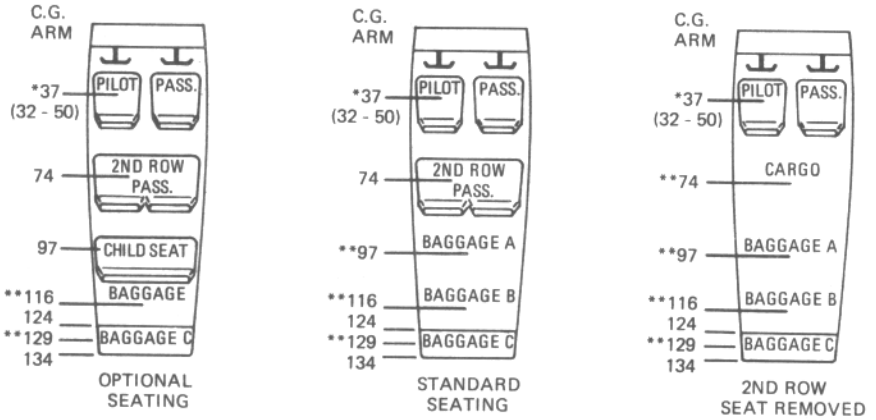
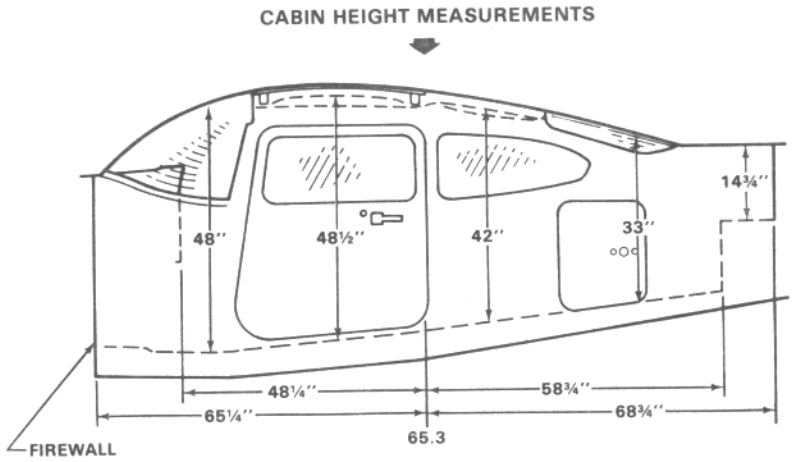


Figure 6-3. Loading Arrangements



DOOR OPENING DIMENSIONS

	WIDTH (TOP)	WIDTH (BOTTOM)	HEIGHT (FRONT)	HEIGHT (REAR)
CABIN DOOR	32"	36½"	41"	38½"
BAGGAGE DOOR	15¾"	15¾"	22"	20½"

═══ WIDTH ═══
•LWR WINDOW LINE
*CABIN FLOOR

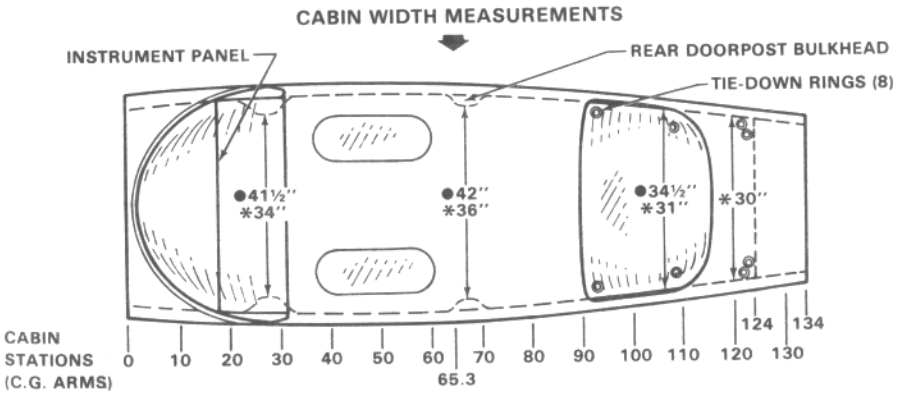


Figure 6-4. Internal Cabin Dimensions

SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	1800	63.3		
2. Usable Fuel (At 6 Lbs./Gal) Standard Tanks (88 Gal. Maximum)	528	24.6		
Reduced Fuel (65 Gal.)				
3. Pilot and Front Passenger (Station 32 to 50)	340	12.6		
4. Second Row Passengers	340	25.2		
Cargo Replacing Second Row Seats (Sta. 65 to 82)				
5. *Baggage (Area "A") or Passenger on Child's Seat (Sta. 82 to 109) 120 Lbs. Maximum	90	8.7		
6. *Baggage (Area "B") (Sta. 109 to 124) 80 Lbs. Maximum	12	1.4		
7. *Baggage (Area "C") (Sta. 124 to 134) 80 Lbs. Maximum				
8. RAMP WEIGHT AND MOMENT	3110	135.8		
9. Fuel allowance for engine start, taxi and runup.	-10	-.5		
10. TAKEOFF WEIGHT AND MOMENT (Subtract step 9 from step 8)	3100	135.3		

11. Locate this point (3100 at 135.3) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable; provided that flight time is allowed for fuel burn-off to a maximum of 2950 pounds before landing.

*The maximum allowable combined weight capacity for baggage in areas A, B, and C is 200 pounds.

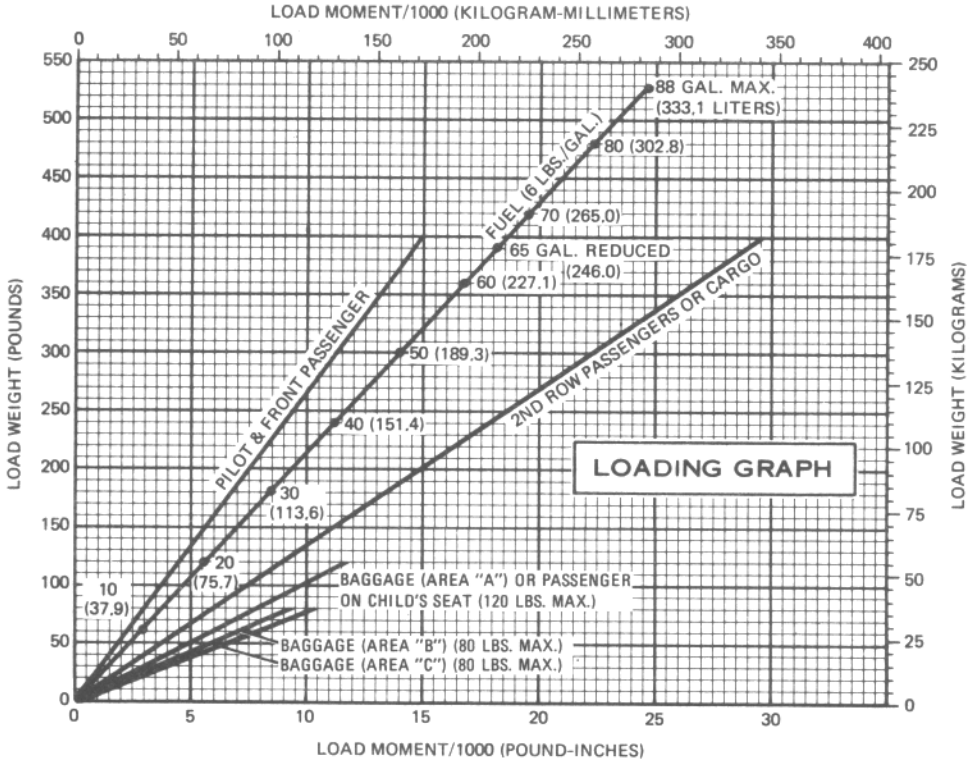
*The maximum allowable combined weight capacity for baggage in areas B and C is 80 pounds.

Figure 6-5. Sample Loading Problem (Sheet 1 of 2)

YOUR AIRPLANE		YOUR AIRPLANE		YOUR AIRPLANE		YOUR AIRPLANE	
Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)

When several loading configurations are representative of your operations, it may be useful to fill out one or more of the above columns so that specific loadings are available at a glance.

Figure 6-5. Sample Loading Problem (Sheet 2 of 2)



NOTE: 1. Line representing adjustable seats shows pilot and front seat passenger center of gravity on adjustable seats positioned for an average occupant. Refer to the Loading Arrangements diagram for forward and aft limits of occupant C.G. range.

Figure 6-6. Loading Graph

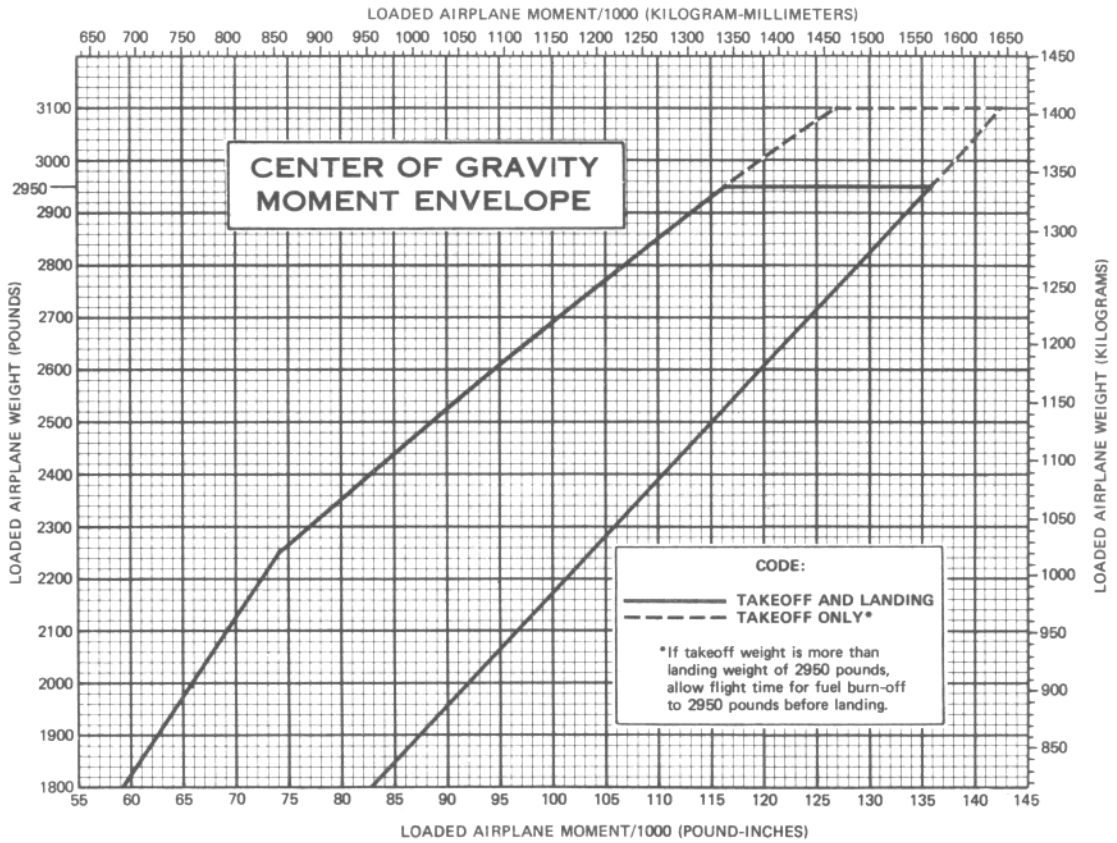


Figure 6-7. Center of Gravity Moment Envelope

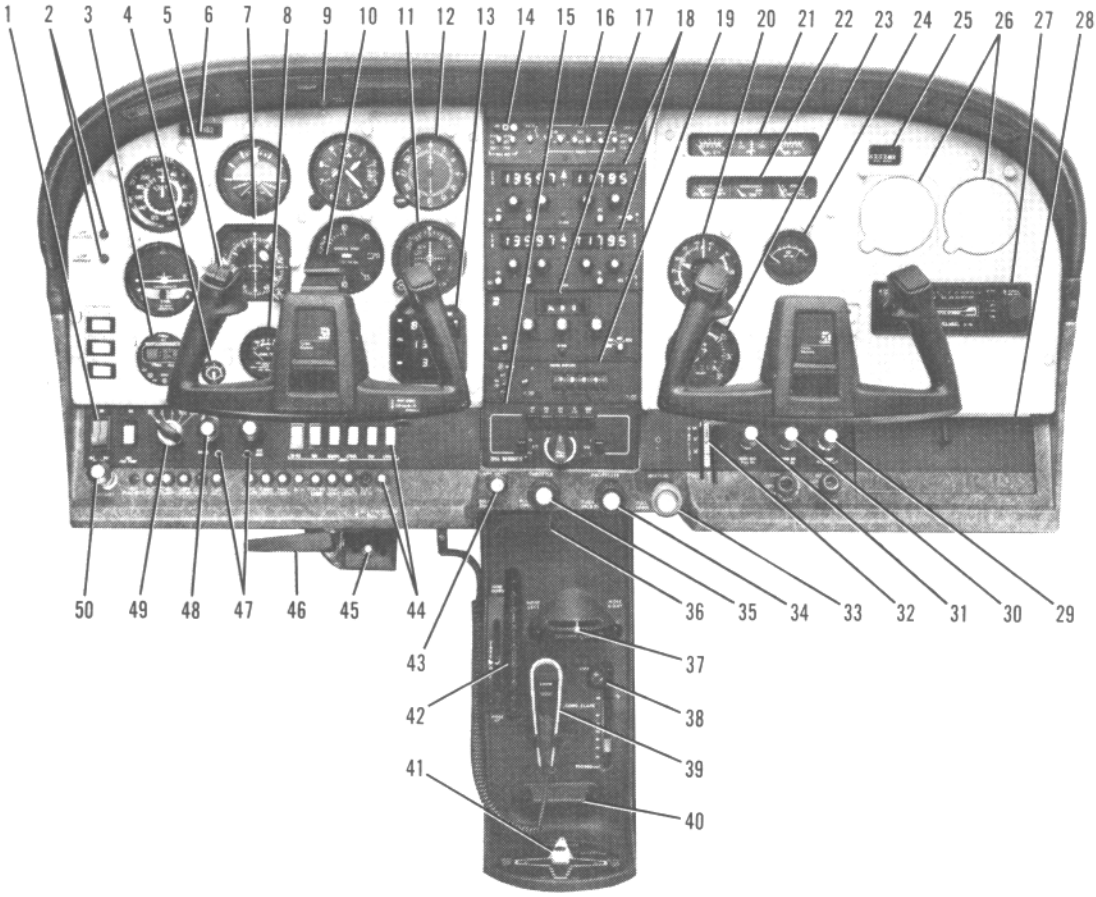


Figure 7-2. Instrument Panel (Sheet 1 of 2)

1. Master Switch
2. Low-Voltage and Low-Vacuum Warning Lights
3. Digital Clock
4. Suction Gage
5. Electric Elevator Trim Switch
6. Airplane Registration Number
7. Flight Instrument Group
8. Carburetor Air Temperature Gage
9. Approach Plate Light and Switch
10. Approach Plate Holder
11. Course Deviation Indicator
12. ADF Bearing Indicator
13. DME
14. Marker Beacon Indicator Lights and Switches
15. Autopilot Control Unit
16. Audio Control Panel
17. ADF Radio
18. Nav/Com Radios
19. Transponder
20. Manifold Pressure Gage
21. Fuel Quantity Indicators and Ammeter
22. Cylinder Head Temperature, Oil Temperature, and Oil Pressure Gages
23. Tachometer
24. Economy Mixture Indicator (EGT)
25. Flight Hour Recorder
26. Additional Instrument Space
27. Cassette Stereo, AM/FM Entertainment Center
28. Map Compartment
29. Defroster Control
30. Cabin Air Control
31. Cabin Heat Control
32. Wing Flap Switch and Position Indicator
33. Mixture Control
34. Propeller Control
35. Throttle (With Friction Lock)
36. Control Pedestal Light
37. Rudder Trim Control Wheel and Position Indicator
38. Cowl Flap Control Lever
39. Microphone
40. Fuel Selector Light
41. Fuel Selector Valve Handle
42. Elevator Trim Control Wheel and Position Indicator
43. Carburetor Heat Control
44. Electrical Switches and Circuit Breakers
45. Static Pressure Alternate Source Valve
46. Parking Brake Handle
47. Auxiliary Phone and Mike Jacks
48. Instrument and Radio Dial Lights Dimming Rheostats
49. Ignition Switch
50. Manual Primer

Figure 7-2. Instrument Panel (Sheet 2 of 2)

SERVICING

In addition to the PREFLIGHT INSPECTION covered in Section 4, COMPLETE servicing, inspection, and test requirements for your airplane are detailed in the Service Manual. The Service Manual outlines all items which require attention at 50, 100, and 200 hour intervals plus those items which require servicing, inspection, and/or testing at special intervals.

Since Cessna Dealers conduct all service, inspection, and test procedures in accordance with applicable Service Manuals, it is recommended that you contact your Cessna Dealer concerning these requirements and begin scheduling your airplane for service at the recommended intervals.

Cessna Progressive Care ensures that these requirements are accomplished at the required intervals to comply with the 100-hour or ANNUAL inspection as previously covered.

Depending on various flight operations, your local Government Aviation Agency may require additional service, inspections, or tests. For these regulatory requirements, owners should check with local aviation officials where the airplane is being operated.

For quick and ready reference, quantities, materials, and specifications for frequently used service items are as follows:

OIL

OIL SPECIFICATION --

The airplane was delivered from the factory with a corrosion preventive aircraft engine oil. This oil should be drained after the first 25 hours of operation.

MIL-L-6082 Aviation Grade Straight Mineral Oil: Use to replenish supply during the first 25 hours.

Continental Motors Specification MHS-24 Aviation Grade Ashless Dispersant Oil: Oil conforming to Continental Motors Specification MHS-24, and all revisions or supplements thereto, **must be used** after first 25 hours. Refer to Continental Aircraft Engine Service Bulletin M82-8, and any superseding bulletins, revisions, or supplements thereto, for further recommendations.

RECOMMENDED VISCOSITY FOR TEMPERATURE RANGE--

All temperatures, use multi-viscosity oil or
Above 4°C (40°F), use SAE 50.
Below 4°C (40°F), use SAE 30.

NOTE

When operating temperatures overlap, use the lighter grade of oil. Multi-viscosity oil is recommended for improved starting in cold weather.

CAPACITY OF ENGINE SUMP -- 12 Quarts.

Do not operate on less than 9 quarts. To minimize loss of oil through breather, fill to 10 quart level for normal flights of less than 3 hours. For extended flight, fill to 12 quarts. These quantities refer to oil dipstick level readings. During oil and oil filter changes, one additional quart is required.

OIL AND OIL FILTER CHANGE --

After the first 25 hours of operation, drain engine oil sump and change the filter. Refill sump with ashless dispersant oil. Drain the engine oil sump and change the filter each 50 hours thereafter. The oil change interval may be extended to 100-hour intervals, providing the oil filter is changed at 50-hour intervals. Change engine oil and filter at least every 6 months even though less than the recommended hours have accumulated. Reduce intervals for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.

NOTE

During the first 25-hour oil and filter change, a general inspection of the overall engine compartment is required. Items which are not normally checked during a preflight inspection should be given special attention. Hoses, metal lines and fittings should be inspected for signs of oil and fuel leaks, and checked for abrasions, chafing, security, proper routing and support, and evidence of deterioration. Inspect the intake and exhaust systems for cracks, evidence of leakage, and security of attachment. Engine controls and linkages should be checked for freedom of movement through their full range, security of attachment and evidence of wear. Inspect wiring for security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration, and corroded terminals. Check the alternator belt in accordance with Service Manual instructions, and retighten if necessary. A periodic check of these items during subsequent servicing operations is recommended.

FUEL

APPROVED FUEL GRADES (AND COLORS) --

100LL Grade Aviation Fuel (Blue).